Debt Management Recommendations for the Medium Term

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BIDE/GIAT-USAID

May 27, 2004

GROWTH THROUGH INVESTMENT, AGRICULTURE AND TRADE (GIAT)

A USAID/GOI Project

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[*] GIAT is a United States Agency for International Development (USAID)-funded Project with the Government of Indonesia. The views expressed in this report are those of the author's and not necessarily those of USAID, the U.S. Government or the Government of Indonesia.

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Abstract

A declining reliance on funding from the *Consultative Group for Indonesia* (CGI) has increased the need for the Republic of Indonesia to engage in commercial borrowing to meet spending priorities. Taking borrowing needs as given, a borrowing strategy for the medium term is developed that emphasizes two main objectives: (i) to deepen the liquidity and improve the terms of borrowing in the dollar-denominated debt market, and (ii) to alter the overall debt portfolio at the margins so that it can better serve as a hedge against uncertainty in the government's net cashflow. Recommendations include slowing the rate of decline in CGI debt and engaging in regular issuances of 5- and 10-year dollar-denominated sovereign bonds.

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Executive Summary

1. The Government of Indonesia is undergoing a change in the way its budget is financed. A previous heavy reliance on borrowing through the Consultative Group on Indonesia (CGI) and Paris Club restructuring is being replaced by financing through onshore and offshore commercial bond markets.
2. A clear strategy for managing its debt portfolio and clear borrowing protocols will increase Indonesia's sovereign bond rating and lower its cost of borrowing.
3. A good debt management strategy will achieve two goals:
   (a) *Lowering the cost of borrowing.*—This can be achieved by creating greater liquidity in key markets, especially the domestic government market and the medium- to long-term USD dollar-denominated external bond market. Liquidity in the first can be promoted through regulatory reforms that encourage active trading in the secondary market for rupiah-denominated government debt, but the quantity of instruments in that market should be sufficient. Liquidity in the dollar-denominated bond market would be promoted by increasing the *quantity* of instruments available by issuing USD 500 million in 5-year bonds and USD 500 million in 10-year bonds, such that in five years all maturities along the yield curve out to 10 years in Indonesian sovereign debt can be traded.
   (b) *Reducing the vulnerability of the debt portfolio to confidence crises and external shocks.*—The composition of Indonesia's debt and its borrowing can be adjusted so as to minimize the impact of changes in exchange rates, interest rates, investor confidence, and other factors on the government's repayment burden. Careful consideration of the currency-composition, maturity-structure, and degree and type of indexation can lead to the determination of an "optimal" portfolio that carries the least risk of a sharp increase in costs. Calculations contained in this report suggest an optimal portfolio of 60 to 70 percent rupiah-denominated debt and 30 to 40 percent dollar-denominated debt. The inclusion of the net government cashflow in this analysis is more nuanced however.
4. Another important objective is the eventual replacement of Bank Indonesia's SBI open market instruments with short-maturity government treasuries. The transition process, when complete, will provide the Treasury with a potentially low cost form of financing at the margin and Bank Indonesia with a better instrument for controlling the money supply. However, this is a long term goal, and the government would do well to avoid heavy exposure to short-maturity debt.
5. The future role of CGI financing should be given careful consideration, as it is likely to carry certain benefits that may make it worth prolonging to the extent possible. These benefits include a lower cost of borrowing, long maturities, and the possibility of restructuring should repayment difficulties arise.

1 Introduction

With the decline of loan disbursements from the Consultative Group on Indonesia (CGI) from USD 5 billion to USD 2 billion over the course of the last three years, there has been a new emphasis on external borrowing in commercial markets. Simultaneously, the market for domestic sovereign debt has become more active as recapitalization bonds, extended to banks during the financial crisis of 1997-1998, are more heavily traded in the second-hand market. The restructuring (that is, re-profiling) of a portion of the recapitalization bonds by the government has also altered the characteristics of the market for domestic debt.

Given the rapid changes in the nature of the government's outstanding liabilities, and its new relationships with various commercial debt markets both on- and off-shore, there is a growing need to articulate a consistent debt management strategy to the markets. On the one hand, the *size* and *sustainability* of the debt are at issue. The terms of borrowing and repayment will worsen if fiscal policies regarding the budget deficit are perceived as unsustainable. On the other hand, for any given level of borrowing (and outstanding stock of debt), the *composition of borrowing* (and the debt stock) will affect the terms of borrowing and overall government welfare as well.

The interaction between debt composition and broader government objectives is the object of this study. At the center of this interaction lies a tension between obtaining the lowest cost and reducing the risk that debt service poses to other government objectives. There is usually a tradeoff between the two, in other words, a lower immediate cost of borrowing is likely to increase the riskiness of the government's debt portfolio. To reduce risk, an emphasis must be placed on diversification, rather than on concentrating debt in the lowest (expected) cost debt instrument. The debt portfolio can be diversified along several dimensions, including currency-composition, maturity structure, and degree of indexation. Given the abundant recommendations from the literature regarding maturity structure and indexation, we focus mainly on currency-composition in the models discussed below.

In order to better understand this tradeoff, two broad conceptual approaches are used in this study. One approach, based on the "habitat" model, focuses on the liquidity of bond markets and other institutional factors likely to affect the cost of borrowing. The other, related to the asset pricing literature, focuses on using the composition of debt to hedge against risk related to the government's net cashflow, that is, revenues minus expenditures. Together these two approaches provide guidance on actions that can be taken to change the debt portfolios at the margin.

Deciding upon an optimal structure of government debt is an important guide for the medium-term, but the inherited structure of the government's debt cannot be changed instantaneously (particularly without the ability to engage in currency swaps and posi-

tions in derivative hedging instruments on a large scale). The currency-composition and maturity-structure of new borrowing will be the primary means of moving the debt composition towards its optimal configuration. Equally important will be decisions regarding the active reduction of CGI loans, which have had a large effect on the composition of debt thus far.

We first describe the current debt position of the Indonesian government and projected funding needs in Section 2. Next we describe the global market for government bonds in Section 3. Section 4 below lists five objectives that should guide debt management, while Section 5 describes how the composition of government debt can be used to hedge against risk. Section 6 offers recommendations for debt management in the near term, and Section 7 concludes.

2 Description of Indonesian Outstanding Debt and Borrowing Needs

Currently, Indonesia's sovereign debt is roughly evenly balanced between domestic and external debt. However, projections indicate a decline in external debt relative to domestic debt.—Figure 1 illustrates the distribution of Government of Indonesia (GOI) debt between external and domestic debt over the last five years. In 1999, GOI external debt (converted using the appropriate 1999 exchange rate) was IDR 536.7 trillion (or 52 percent of total debt) while domestic debt was IDR 496.6 trillion (48 percent). For 2003, these stocks stand at IDR 652.6 trillion for external debt (48.7 percent) and IDR 619.7 trillion for domestic debt (51.3 percent). The stability of the breakdown between domestic and external debt in Figure 1 is expected to give way to a declining share of external debt in GOI's outstanding debt.[1] Figure 2 shows projections of domestic and external debt for 2004 through 2010. By 2010, domestic GOI debt is expected to rise to IDR 712.4 trillion (or 60 percent), while external GOI debt is anticipated to decrease to 531.1 percent (40 percent).[2]

CGI-related debt will continue to dominate the external debt position of the GOI, even though the role of the CGI as a key source of funding is in decline.—Figure 3 provides a annual breakdown of GOI's external debt for the years 1997 through 2003 into CGI-related debt, commercial debt, and other debt.[3] From a

[1]Source: World Bank Brief for the Consultative Group on Indonesia, Report No. 27374-IND, December 2003.

[2]Source: internal MOF calculations.

[3]The vast majority of the "other" debt (around 95 percent) consists of export credits, which are to a certain extent extended by the same bilateral lenders that compose the CGI. It is unclear how closely linked these export credits are with CGI lending. Source: internal MOF calculations.

stock of 38.2 billion USD in 1997, CGI debt has increased to 56.9 billion USD in 2003. Under the IMF structural adjustment program of 2000-2001, the GOI was able to access the Paris Club and restructure its bilateral debt. From an initial balance of around 5 billion USD in project and program loans and 5 billion USD in repayments on CGI debt just prior to the 1997-1998 crisis, CGI borrowing has declined to approximately 2 billion USD with repayments on CGI debt–confined primarily to interest payments on the bilateral portion of CGI debt as per the Paris Club restructuring agreements–declining by a similar amount. Because principle is not being paid down on bilateral debt, the stock of CGI debt is likely to remain relatively stable.

The central government issued its first commercial external debt through a 1 billion USD bond issue in February 2004. This commercial debt is a minor part of the external stock of foreign debt.

Figure 4 provides a breakdown of government external debt by currency. External debt is mainly denominated in USD and JPY in roughly equal proportions, (38 and 35 percent, respectively). These two currencies account for 73 percent of external debt, with the remainder split evenly between the SDR and EUR.[4]

The one-time infusion of recapitalization bonds has created a debt burden that must be smoothed over time.—The need to recapitalize the banking sector prompted the central government to inject recapitalization bonds into the various banks in place of non-performing loans, which were subsequently transferred to the Indonesian Bank Restructuring Agency (IBRA). These bonds are coming due in larger amounts, even as the sale of IBRA assets is coming to a close. Figure 5 presents the total stock of recapitalization bonds and Guarantee Program bonds, which together make up almost the entire stock of domestic debt.[5] Guarantee Program bonds are related to the MOF's obligations to compensate Bank Indonesia for liquidity support to commercial banks during the financial crisis. The outstanding stock of Guarantee Program bonds has been roughly constant thus far at IDR 218 trillion. Recapitalization bonds remain close to IDR 400 trillion after peaking at IDR 430.7 trillion in 2001.

Figure 6 disaggregates the stock of recapitalization bonds into variable rate bonds, fixed rate bonds, and hedge bonds using data for September 2003.[6] Variable rate bonds are the largest component at 58 percent, with fixed rate bonds comprising the next largest category at 38 percent. The MOF has recently "re-profiled" the recapitalization bonds, thereby smoothing the maturity structure of the bonds over the next decade, as shown in Figure 7. Two key features of this maturity structure are the peak in repayments estimated in 2008 of IDR 40.2 trillion (compared to an average repayment over the period

[4]Source, Bank Indonesia, Indonesian Financial Statistics, February 2004.

[5]Source: World Bank Brief for the Consultative Group on Indonesia, Report No. 27374-IND, December 2003. Table 22.

[6]Ibid. Table 22.

of 2003-2020 of about IDR 22 trillion), and the phasing out of fixed rate bonds in 2013.[7]

Domestic borrowing has achieved a more consistent rhythm.—In February 2004, the Indonesian Government issued 2 trillion IDR in domestic rupiah-denominated bonds at a yield of 11.8 percent. A second tranche of again 3 trillion IDR was issued in March 2004 at a yield of 11.5 percent, with a third tranche of 3 trillion IDR at 10.7 percent in April 2004. A fourth tranche was to be issued in May, but the government chose not to accept the higher yields of 11.7 percent required by investors, and the bonds were not issued.

The second-hand domestic bond market has become more liquid primarily as a result of declining interest rates.—Over the past two years, falling interest rates have increased the attractiveness of government bonds due to the greater desirability of their yields. Consequently, capital gains have been realized by mutual fund portfolios that specialize in government bonds and engage in marking-to-market the value of the bonds. However, the liquidity of the second-hand market is still limited with active trading in only IDR 70 to 80 trillion worth of the outstanding stock. Legislation is currently being prepared to govern the interbank market in government bonds as well as to require the banks to mark their recapitalization portfolios to market as well. However, in the absence of a sufficiently liquid market, banks will become extremely vulnerable to interest rate spikes that will cause large capital losses in their bond portfolios.

Projected funding needs are moderate.—Figure 8 shows projected revenues and expenditure totals for the GOI from 2004 through 2010. As can be seen in Figure 9, the projected budget deficit of approximately IDR 25 trillion in 2004 is expected to disappear by 2007 and turn into a surplus of IDR 8.3 trillion by 2010.

However, contingent liabilities could be costly.—According to Brixi and Goopta (2002), Indonesia faces large contingent liabilities related to: (i) the stock of debt of both the central government, banks, and state enterprises, (ii) the large share of revenue that must be devoted to debt service payments (over 40 percent) and its composition, (iii) social and political pressures for new spending, (iv) and, "...off-budget obligations associated with financial institutions, state-owned enterprises, independent government agencies, and subnational governments." These liabilities are vulnerable to changes in factors such investor confidence, domestic interest rates, political actions, policy actions, operational risks, the exchange rate, and commodity prices. Current research is being undertaken to evaluate how costly contingent liabilities are likely to be.

Sales of assets from privatization and asset recovery are expected to cover a substantial amount of the deficit initially, but are also expected to end in 2009.—Figure 10 indicates that asset sales are expected to yield around IDR 10 trillion through 2008, IDR 5 trillion in 2009, and to phase out entirely by 2010. Thus, a full 40

[7]Source: internal MOF calculations.

percent of the current 2004 budget deficit is expected to be financed by asset sales.

Net external financing is anticipated to be negative, increasing funding needs from other sources.—Figures 11 and 12 show the net external financing financing projections for the GOI. The net external financing position is expected to be negative and average IDR 18.9 trillion over the period 2004 to 2010. The burden is expected to be relatively higher in the latter part of the range, reaching almost IDR 23 trillion in 2009. Of the inflows, project loans are expected to dominate program loans through 2006, after which program loans are expected to end. Project loans are anticipated to continue at slightly over IDR 20 trillion at least through 2010.

The composition of debt service payments on government debt differs significantly from the composition of the debt itself.—This final point is illustrated in Figure 13, which shows the projected interest payments on domestic and external debt. Domestic interest payments make up roughly two-thirds of expected debt service payments through 2010 which, given that the debt stocks are approximately evenly distributed, implies that the cost of domestic debt is expected to be much higher. Figure 14 shows the anticipated interest rates on domestic and external debt. The implicit interest rate on external debt, calculated by dividing the debt service payments by the outstanding stock of debt, is expected to decline steadily from 4.6 to 3.9 percent over the period 2004 to 2010, while the implicit interest rate on domestic debt (calculated in the same fashion) is expected to rise initially (from 6.5 to 7.2 percent) but then decline steadily to 6.1 percent. These expectations generate an average implicit interest rate premium on domestic debt of 2.5 percent over the full period.

3 Lessons from the Global Market for Sovereign Bonds

We turn now to a description of the global market for sovereign bonds featuring data and empirical results taken from Claessens, Klingebiel, and Schmukler (2003), hereafter CKS, unless otherwise noted.[8]

The global sovereign bond market grew substantially during the 1990's, but the sovereign bond market for emerging economies grew even faster.—Using data from the Bank for International Settlements (BIS), CKS find that the market for sovereign bonds increased from 14 trillion USD in 1993 to 19 trillion USD in 2000, a percentage growth rate of 36 percent. The percentage growth rate of emerging economy government bonds was even higher though at 187 percent, rising from 381 billion USD in 1993 to 1 trillion USD in 2000. Despite this rapid growth, emerging economies' share of

[8]CKS include local government debt as well, so they refer to the market for "government bonds" as opposed to sovereign bonds, per se.

the global market for sovereign debt is still only 5 percent.

The composition of debt favors local currency bonds in both developed and emerging economies.—Of the 1.036 trillion USD in emerging market debt as of 31 December 2000, 83 percent was issued in local currency while 17 percent was issued in foreign currency. The largest local currency participants in the 858 billion USD in local currency issues were Brazil (at 29 percent), China (at 26 percent), and South Korea (at 9 percent). The largest participants in the 178 billion USD of foreign currency-denominated sovereign debt were Argentina (at 31 percent), Mexico (at 18 percent), and Brazil (at 15 percent). For developed countries, 98 percent of sovereign bonds were denominated in local currency.

Of foreign currency-denominated bonds, the majority were issued in the Eurobond market which is predominantly denominated in USD.—Within the 178 billion USD of foreign currency-denominated debt in December 2000, the Eurobond market accounted for 161 billion USD. Roughly 63.7 percent of the Eurobond market was composed of USD issues, with the Euro accounting for another 16.2 percent, and other currencies for the remainder (including the yen, Swiss franc, and French franc). The remaining 19 billion USD worth of foreign bond markets were denominated 26 percent in USD and the remainder in various other currencies.

While the ratio of foreign currency-denominated debt to GDP has declined for developed countries over the period 1993-2000, it has increased for developing countries.—The ratio of foreign currency-denominated debt to GDP declined for developed countries from 10 percent in 1993 to 6 percent in 2000. But for developing countries, this ratio increased from 2 percent to 5 percent over the same period. The mean share of new issues of government bonds in foreign currencies in emerging economies increased from 10 percent in 1993 to around 20 percent in 2000. These two trends offset one another in the aggregated global market, keeping the foreign currency share (which has always been smaller than the domestic currency share for most countries) relatively constant.

Countries with larger GDPs tend to have larger sovereign bond markets.—Developed countries may end up with larger sovereign bond markets for two reasons: (i) better institutional frameworks and sounder fiscal policies may allow stronger repayment capacity and the ability to support higher debt-to-GDP ratios, and (ii) government may play a larger role in developed economies, particularly in terms of transfers related to medical care and social security. Alternatively, this result may indicate economies of scale in setting up, "...the infrastructure of local bond markets, including the fixed costs of establishing clearing and settlement systems and developing the legal framework for issuing and trading. Also, it is very likely that scale effects increase liquidity in secondary markets for bonds." (CKS, p. 16)

Countries with larger banking systems issue more debt.—Larger depositor bases may create more demand for sovereign bonds, or perhaps deposit-taking banks hold significant shares of their assets in sovereign bonds. In addition, large banking systems tend to correlate with large institutional investor bases, and easier distribution channels through which citizens may purchase sovereign debt. Altogether, these institutions may help create a more liquid secondary market for sovereign debt.

Lower inflation rates are associated with both larger domestic- and foreign currency-denominated sovereign bond markets relative to GDP.—Because inflation is a way of repudiating long-term domestic-currency denominated sovereign debt, the higher the inflation rate becomes the less of this debt investors are willing to absorb. The fact that countries with higher inflation tend to issue less foreign currency-denominated debt as a fraction of GDP is a little surprising as foreign currency-debt does not carry the risk of being depreciated by local inflation. However, inflation may be associated with broader macroeconomic instability, which would undermine confidence in that country's sovereign debt. In fact, higher inflation tends to *lower* the share of foreign currency-denominated debt out of total debt.

Countries with good democratic institutions have larger sovereign bond markets relative to their GDP.—This may be because investors associate functioning democracies with, "...greater credibility of the state, better quality of decision making, and a wider public's acceptance of the overall policy making process, including macroeconomic policy making." (CKS, p. 17)

Countries with a more flexible exchange rate regime (de jure or de facto) tend to have larger domestic currency-denominated sovereign bond markets and smaller foreign currency bond markets relative to GDP.—Perhaps this is because a flexible exchange rate cushions shocks that would otherwise cause sharp devaluations of the currency or large inflation spikes. In addition, countries with flexible exchange rates may choose to finance themselves more with domestic currency-denominated debt because the real value of repayments is less vulnerable to exchange rate fluctuations. Indeed, more flexible (de facto) exchange rate regimes tend to be associated with a higher share of domestic currency-denominated debt and vice versa. An interesting implication of this finding is that fixed exchange rate regimes may encourage foreign borrowing and consequently increase vulnerability to a collapse in the peg.

Countries with smaller GDPs tend to issue a larger amount of sovereign bonds in foreign currency.—This may be a result of a small domestic market that is too illiquid to absorb the amount of debt the government wishes to issue without significantly increasing the cost of borrowing. Another way of putting this is that this result could reflect the scale effects discussed above, which suggests that *there are some limits to the development of local bond markets.*

Building credibility may require a government to steadily issue debt over some time in which domestic currency-denominated debt (or foreign currency-denominated debt) may appear more costly initially, but after which financing costs decline.—A decline in financing costs would come about due to the "economies of scale" argument described above.

4 Five Objectives of Debt Management

Many helpful lessons are to be learned from the academic literature on debt policy, much of which has treated the United States experience. By the early 1900's, throughout a period marked by large swings in the business cycle, the United States government had accumulated a significant amount of sovereign debt. Because the burden of this debt had such a large impact on the government budget, and because the composition of the debt affected the stability of government finances, debt management policy was considered to be on par with fiscal and monetary policy. The increase in US debt during the 1980s renewed interest in these issues, and US academic research on optimal debt strategies has made significant progress over the last two decades. This literature has focused to a large extent on the importance of reputation in obtaining favorable terms for borrowing as well as how to exploit the yield curve to reduce the cost of borrowing.

The debt experience of other countries has been included in this literature as well, most importantly the focus on the unique challenges of developing country debt management since the (primarily Latin) debt crisis of the 1980s. Problems in handling debt can be found at the core of almost every major crisis of recent decades, most recently the Mexican peso crisis of 1994 and the Asian financial crisis of 1997. Not all of these crises were caused by sovereign debt mismanagement, but many were strongly related. For example, on the eve of the peso crisis, Mexico was exceptionally vulnerable to a confidence crisis due to its large stock of extremely short-maturity, dollar-denominated "tesebonos" government-backed bonds, which had to be rolled over in vast sums on a daily basis. A suddenly unwillingness of investors to buy (and roll over) these bonds, even at high interest rates, led to economic collapse and ruin.

It should be stressed that the historical record chronicled in the literature demonstrates that prudential borrowing is a useful option for government financing. Every modern nation in the world has found a role for borrowing, particularly in financing project-related improvements to infrastructure and public services. Yes, history also contains a depressingly large number of examples of countries that have experienced devastating crises as a result of failing to manage the riskiness of their debt portfolios (by, for example, letting the maturity structure become too short as explained above, or allowing repayments to become "bunched together" in specific time periods), or by allowing the debt to become

too large relative to GDP (creating a "debt overhang"). But the lesson is that proper debt management should be used to avoid crisis, and that fiscal policy should be prudent and guarantee government solvency, *not* that borrowing itself is unwise.[9]

The question of how much debt a government can safely handle in relation to its budget is a separate question beyond the scope of this paper. We take the level of debt as given, and focus instead on the ideal composition of this debt.[10] We are interested in the right mix of bonds denominated in dollars or in rupiah, and the right mix of bonds of long- and short maturity. What follows is a description of five principles of debt management taken from the academic literature that should be considered before deciding on the ideal composition of government debts. A more complete survey of this literature on debt management is being distributed separately.

4.1 Burden Smoothing

From a macroeconomic perspective, the fundamental concern is with the "time profile" of future government revenues, expenditures, and contingent liabilities. By time profile, we simply mean the projected amounts of each of these items, year-by-year. Burden smoothing means arranging the maturity structure of sovereign debt such that a relatively higher amount of repayments would fall on dates at which government expenditures are otherwise expected to be low. Likewise, smaller levels of repayments should come due at dates in which government expenditures are relatively higher. In this way, the overall burden on the government can be "smoothed" over time, and taxes can be kept relatively flat over time as well. Reducing the volatility of taxes is important. A key insight of public finance economics is that taxes impose a "deadweight loss" in welfare on the economy, but this welfare loss can be minimized if taxation can be kept relatively flat over time.

If government expenditures and revenues are expected to be fairly constant over time, then the ideal maturity structure of government debt, according to the burden-smoothing principle, is to distribute maturities evenly across all years. This idea has intuitive appeal, particularly in the case of basic government expenditures and revenues. Yet the financing burden of contingent liabilities should also be included in this analysis, and it seems less reasonable to assume that this burden is evenly distributed over time (especially since many contingent liabilities depend upon the demographic structure of the economy). In this case, perhaps the maturity structure of government debt should be coordinated to take

[9]See Obstfeld (1998) for an overview of the desirability of tapping external capital markets. In an illuminating paper, Bevilaqua and Garcia (2000) describe the interlinkages between fiscal policy and debt maturity structure in the case of Brazil. Booth and Reid (1992), Kawai (1985), Purvis (1985), and Wilcox (1989) discuss the sustainability of government deficits.

[10]Measuring the *value* of outstanding debt can be difficult, although useful for evaluating the desirability of debt buyback programs. See Booth and Reid (1986) and Strong (1989) for approaches to this problem.

into account foreseeable changes in contingent liabilities: reducing the debt repayment burden when the burden of contingent liabilities is high, and vice versa.

4.2 Prevent Market Suspicion of Repudiation

One of the classic problems in public finance is how to avoid the "time-inconsistency" problem. We illustrate the time-inconsistency problem using debt management as our example as follows: a government finds it in its best interest to announce a policy of low inflation just before issuing a long-term domestic currency-denominated bond. Low inflation means that even modest nominal yields give a reasonable real return to investors in the bond, and the government is likely to be able to borrow at advantageous terms. However, once the bond is issued and purchased, the government then has an incentive to increase the inflation rate so as to reduce the real burden of the debt repayment. Inflation reduces the government's burden because it is paying the bondholders back with rupiah that are worth less than the bondholders were initially expecting. This is known as debt repudiation through inflation, or "monetizing the debt". The time inconsistency should be clear: the government wants low inflation initially, but inconsistent with this position wants high inflation after issuing the bonds.[11]

If the government is only going to borrow once, this trick may represent an appropriate strategy. However, almost all governments find the need to return to capital markets to borrow again and again. In fact, investors do not even need to be tricked for them to recognize the danger of purchasing long-term domestic currency-denominated bonds. They can figure out the incentives facing the government fairly easily. How these investors assess the danger of repudiation will depend on many factors, but history shows that investors could suddenly start to panic over repudiation fears without warning. Once the market comes to anticipate that repudiation may occur (for good reasons or not), the cost of issuing new debt may rise substantially and, in extreme cases, further borrowing may not be possible.

In order to prevent repudiation panics, the government can develop a reputation for low inflation (that is, no repudiation). Unfortunately, this reputation may not carry over from one administration to the next whenever elections are held, and each new administration may have to begin building its reputation anew. A superior option is to manage the composition of the debt such that a significant share of it cannot be repudiated by inflation (because it is denominated in foreign currency, inflation-indexed, extremely short term, etc.).[12] Of course, inflation is not the only way that debt can be repudiated, governments can announce capital levies on debt, a partial or full default, etc. Unlike

[11]For a discussion of the "multiple equilibria" that can develop based on changing expectations regarding the threat of repudiation, see Cole and Kehoe (1998, 2000).

[12]See Calvo (1988), and Calvo and Guidotti (1990, 1992).

other forms of repudiation, though, repudiation through inflation is a type of repudiation whose perceived risk the government can actively address through debt management.

4.3 Reduce the Cost of Borrowing

Applying the classic corporate finance principle known as the Modigliani-Miller theorem to government finance suggests that it does not matter what kind of bonds the government issues, the cost of borrowing will remain the same regardless. This argument rests on the theory of arbitrage. If certain kinds of Indonesian sovereign debt carried a higher return, investors would try to sell their current Indonesian bonds and purchase the higher return bonds, thereby driving down its yield. If bonds are perfect substitutes for one another, this theorem implies that only the government's fiscal policy matters for the cost of borrowing, insofar as it affects the ability of the government to honor its debt obligations. Its debt management policy is irrelevant.

The institutional structure of the market suggests that this approach is incorrect. The markets for different types of loans tend to be segmented. That is, there are different types of buyers for each type of bond, and they do not tend to want to substitute between different types of bonds even if some arbitrage opportunities exist (of course, for large enough differences in returns, substitution will take place). For example, the primary buyer for Indonesian foreign currency-denominated 5-year bonds would be Asian banks, whereas the primary buyer for Indonesian foreign currency-denominated 10-year bonds would be large institutional investors in the United States. Markets are segmented not only across maturities, but across currency denominations and other characteristics as well. Different borrowers have different appetites for different types of bonds.[13]

One immediate implication of segmented markets is that, since each type of bond is likely to be associated with a different cost to the government, the government could borrow on the cheapest terms by issuing bonds exclusively of the type with the lowest cost. Eventually this kind of strategy would equate the marginal cost of borrowing in each of these different bond markets. This would be a natural outcome of supply and demand: a higher supply of bonds in the lowest cost markets would eventually raise the marginal cost of borrowing in those markets until it equals the cost in the more expensive markets.

Another implication of segmented markets is that the liquidity in each market may differ. Liquidity is commonly measured by the difference in the bid-ask spread in bond

[13]The segmented markets hypothesis, also known as the "habitat" model, has been attributed to Modigliani and Sutch, see for example Modigliani and Sutch (1967). An excellent recent treatment of market segmentation is Grinols and Turnovsky (1998). Estimates and discussions of the degree of segmentation and the factors involved include Carmazza, Clinton, Côtè, and Longworth (1986), Christofides (1975), Dobson (1973), Eaton and Turnovsky (1983), and Frankel (1982).

prices, not by a measure of quantity. Of course, quantity will determine the bid-ask spread: less liquid markets with few bonds actively traded will have a much higher bid-ask spread. One desirable characteristic for sovereign debt from an investor's perspective would be that the investor could easily hedge against capital losses from holding the bonds by either purchasing derivatives or by taking a forward position in the market.

A forward position can reduce risk and lock in returns as follows. An investor simultaneously sells a bond maturing at a specific future date and uses the funds received from selling these bonds to purchase different bonds that mature at a date further into the future. Given that the money received from the sale equals the money used for the purchase, no net investment needs to be made immediately. When the time comes, the investor must pay the buyer of his bonds (this represents the investment) and later receives the payment on the bonds that he purchased (this represents the return on the investment). Thus, using presently known information, the investor can lock in returns over any period in the future.

Being able to hedge in this way reduces risk, and consequently makes bonds that allow for it more attractive. But forward return strategies can only be profitable if there is enough liquidity in the market at each point on the yield curve. Otherwise, if there is insufficient liquidity, the bid-ask spreads are so large as to make these trades unprofitable.

This discussion suggests that a long-term goal of the debt management team should be to "fill-in" the liquidity at all points on the yield curve. Ensuring liquidity at all maturities will promote hedging by investors and lower the cost of borrowing. It will also provide a useful benchmark that should aid Indonesian corporations in issuing their own bonds. A good way to achieve this filling-in in the case of foreign currency-denominated debt would be to issue both 5- and 10-year bonds every year. In five years, this will fill the yield curve out to a 10-year horizon. Why only 5- and 10-year bonds? Apparently, buyers consider these specific types of bonds as "standards" of the market, and as such demand them most.

One final implication of segmented markets is that their liquidity will always be a limited fraction of the total stock of debt despite an active government policy of trying to maximize the liquidity in each market. As a result, issuances of new bonds will cause price fluctuations in the specific market into which the bonds are being issued. If investors have cause to anticipate a regular schedule of new issuances, they will be able to manage this price volatility appropriately. However, if bond issuances are random and unexpected, bond holders will find their market positions weaken without warning. If the government of Indonesia acts opportunistically to try to "time" its borrowing to get the lowest cost, and this leads to a random approach to bond issuances, it will increase the risk associated with Indonesian bonds and perhaps lead to higher costs to the government in the medium run. On the other hand, consistency will not only deepen the liquidity of the markets, lowering costs, but also reduce unexpected volatility, raising the bonds' attractiveness.

4.4 Reduce Vulnerability to Confidence Crises

An extremely important objective is to adjust the maturity structure of debt to reduce vulnerability to crises in confidence. Vulnerability is related to the amount of debt that needs to be rolled over at any given date. The higher the amount of debt that needs to be rolled over, the higher the vulnerability will be. Debt maturities should be arranged so that the repayment (or rollover) schedule is spread evenly over time, avoiding the "bunching up" of repayments at given dates.[14]

With short-term debt, rolling-over must occur more frequently. If a large share of the debt portfolio is held in short-term maturities, a large amount of debt has to be rolled over at every date. Thus, short-term debt should be avoided if possible, even if it appears to be the lowest cost debt. Short-term debt played a large role in the Mexican peso crisis of 1994: a cautionary lesson that has research a large amount of attention in the academic literature.[15]

Regarding cost, it is important to note that short-term debt is not necessarily cheaper even if it carries a lower yield than long-term debt. The reason is that the two yields cannot be directly compared. Rather, the 1-year returns on each type of bond must be calculated and compared. The return on a short bond is usually equal to the yield. However, the return on a long bond is the sum of both the yield and any capital gains or losses on that bond. Relatively small increases in the yield on a long bond imply large capital losses that may wipe out the yield advantage from an investor's perspective.[16] From the government's perspective, small decreases in the yield could represent losses. In a sense, unexpected capital gains for investors represent unexpected capital losses for the government if the change in yield is related to inflation. Nonetheless, if the yield curve is very steep, it may imply that the long bond bears a higher risk premium, and the cost of long bonds may indeed be more costly.[17]

[14] Alesina, Prati, and Tabellini (1990), and Giavazzi and Pagano (1990) advocate this position.

[15] See, for example, Calvo and Mendoza (1996a, 1996b), Edwards (1996), Gil-Diaz and Carstens (1996), and Sachs, Tornell, and Velasco (1996). For lessons on debt maturity beyond Mexico see Bevilaqua and Garcia (2000), Jeanne (2000), Missale and Blanchard (1994), and Makinen and Woodward (1990).

[16] See Campbell (1995) for a lucid discussion of these issues.

[17] The literature on yield curves is vast, but some of the better surveys are Campbell and Shiller (1991), Mankiw (1986), and especially Campbell (1995). For a sophisticated discussion of fluctuating risk premia, see Lee (1989). Finally, it should be noted that the term structure is not exogenous, but will be influenced by government policies (especially if bond markets are segmented). Grinols and Turnovsky (1998), Turnovsky (1989), and Turnovsky and Miller (1984), address the feedback from macroeconomic policy back to the term structure of interest rates.

4.5 Hedge Against Uncertainty

With uncertainty in exchange rates and prices, there are real welfare gains associated with eliminating that uncertainty. Uncertainty that can be reduced or eliminated through careful "natural hedging" strategies (otherwise called "risk management" strategies) is known as "systematic risk". In terms of the government budget, systematic risk might include: patterns of variation in the weather that affect agricultural subsidies and emergency assistance, fluctuations in the price of oil, exchange rate fluctuations that affect the real value of dollar-denominated expenditures or revenues, etc. The effective burden of the debt will be affected by systematic risk as well. Persistent volatility in the exchange rate will cause the real burden of repaying dollar-denominated debt to change substantially, potentially from day to day.

The overall risk to the government of holding debt can be significantly reduced if the government arranges the composition of its debt so as to provide a "natural hedge" against unforeseen changes in the real repayment burden. Ideally, the debt structure can be constructed so that if the real ability of the government to repay the debt falls, the real cost of the debt service will automatically decrease as well to ease the repayment burden. As an example, consider a government that faces an unexpected breakout of price deflation due to a world recession. The burden of servicing the debt denominated in local currency will increase, but such an increase will not necessarily occur in the burden of servicing debt denominated in foreign currency (particularly if the exchange rate appreciates). Thus, holding a portion of the debt in foreign currency-denominated liabilities provides a natural hedge against unexpected deflation. Likewise, holding domestic currency-denominated debt provides a natural hedge against exchange rate shocks.

The key point is that different types of debt need to be blended together to create a debt portfolio that provides the minimum repayment burden risk to the government. Debt can be differentiated by maturity, currency-denomination, and different types of indexing including inflation-indexing and variable rate bonds (which are essentially bonds indexed to the short-term interest rate). The bottom line, of course, is the old saying: "don't put all of your eggs into one basket." In the section that follows, we detail how to determine the optimal currency-composition of debt for hedging purposes.

5 Asset Pricing Methods of Choosing an Optimal Portfolio

This section describes the application of asset pricing techniques to the determination of the optimal composition of debt. The optimal debt "portfolio" is seen to be composed of a speculative portfolio, designed to obtain the minimum cost of borrowing, and a

composite hedging portfolio, designed to minimize risk in the government's cashflow. The speculative portfolio turns out to be difficult to implement, and it is recommended that a prudent government should focus instead on the hedging portfolio. The asset pricing approach described here ignores issues of market liquidity, however, and so the recommended hedging portfolio should be balanced with a strategy designed to enhance overall liquidity in the markets in which the nation wishes to borrow.

5.1 Government Net Cashflow

By stating that the debt portfolio can act as a hedge, we must carefully define exactly how the government is exposed to risk. Claessens' suggests that it is the net government cashflow be calculated and insulated against risk, where net cashflow can be taken to be inflows of tax revenues minus outflows of expenditure and debt service. This net cashflow is sensitive to various degrees to changes in different exchange rates, interest rates, commodity prices, and other key variables.

As an example, consider the revenue side. A portion of the GDP of Indonesia is related to the exports of manufactures and commodities. To the extent that these exports generate tax revenues, changes in the exchange rate that affect the amount of export receipts will also affect the government's net cashflow. Likewise, government expenditures include debt service denominated in yen, US dollars, and SDR. Changes in the exchange rate will affect the burden of the foreign currency-denominated payments.

The objective in measuring the government's net cashflow is to determine its composition in the service of understanding its sensitivity to changes in the economic environment.

Claessens (1992) and Coleman and Qian (1991) focus on total export earnings under the assumption that export earnings are the main determinant of a country's ability to repay external debt. Coleman and Qian in particular examine the case of Papua New Guinea for which exports are primarily commodities such as oil and cocoa. Kroner and Claessens (1989) focus instead on fluctuations in the terms-of-trade, measured as the the unit price of exports divided by the unit price of imports. The currency-composition of debt service payments on existing debt can be added as a source of risk once a decision is made on these other measures.

5.2 The Optimal Debt Portfolio

Claessens (1988, 1992) and Kroner and Claessens (1989) focus on the currency-composition of debt as the primary means of developing an optimal debt portfolio. An alternative approach is Coleman and Qian (1991), who focus instead on a combination of commodity-

linked bonds, that is, bonds whose repayments are indexed to the price of key export commodities. This approach makes most sense for countries heavily dependent on exports of commodities. In what follows, we adopt the approach of Claessens due to the diverse nature of Indonesia's exports and its large share of manufactures in exports.

This section essentially reproduces the analysis of Claessens (1988) with some slight reinterpretations and expanded explanations of the material. We assume that Indonesia can borrow in N different kinds of foreign currency bonds, $B^*(j)$, where the fixed interest rate *in foreign currency* is $R^*(j)$. In order to keep things simple, assume that the return is paid entirely in the form of a capital gain, and the bonds have an instantaneous maturity (that is, they mature over each instant dt) allowing us to write:

$$\frac{dB^*(j)}{B(j)} = R^*(j)dt, \qquad j = 1, \ldots, N.$$

The government can also issue domestic debt whose nominal return is likewise fixed at R. Thus:

$$\frac{dB}{B} = Rdt.$$

Notice that, unlike the concerns expressed in previous sections concerning changes in the risk premium or in market liquidity, there is no interest rate risk in this model. All bond portfolio risk is due to exchange rate fluctuations.[18] Obviously, this assumption is unsatisfying, but it is important for the tractability of the model. The N exchange rates, denoted $e(j)$ and expressed as domestic currency per unit of foreign currency, follow the standard lognormal diffusion process:

$$\frac{de(j)}{e(j)} = \mu_j dt + \sigma_j dZ_{e(j)}. \qquad j = 1, \ldots, N$$

where μ_j is the expected rate of change of currency j (that is, the percentage growth rate) , σ_j is the standard deviation of the growth rate of $e(j)$, and $dZ_{e(j)}$ is a "standard Wiener increment." A Wiener increment is a random variable that can take any value between 1 and -1. Thus, to find out how much the exchange rate fluctuates in a specific instant at time t, we must first find out the value that the Wiener increment takes at that instant and multiply it by the standard deviation of the exchange rate growth rate. Although the range of each Wiener increment is the same for all exchange rates, the realizations of each at any given time t will differ, and each exchange rate will have its own standard deviation. The covariance coefficients between the rates of change of the N exchange rates are given by σ_{ij}, where $i \neq j$.

[18] Claessens (1988) cites Adler and Simon (1986) to provide evidence that this assumption, by placing the major emphasis on exchange rate risk, is partially supported by the data.

The "cost savings" of borrowing by issuing bonds in the jth foreign currency, written $dH(B^*(j))/H(B^*(j))$, is the reduction in the cost of borrowing one unit of domestic currency by issuing a foreign bond rather than issuing a domestic bond instead. We can write it as:

$$\begin{aligned}\frac{dH(B^*(j))}{H(B^*(j))} &= [R - R^*(j)] + \frac{de(j)}{e(j)}, \qquad j = 1, \ldots, N, \\ &= \left(R - \nu_{e(j)} - R^*(j)\right) - \sigma_{e(j)} dZ_{e(j)}.\end{aligned}$$

If uncovered interest rate parity were to hold, then $R - \nu_{e(j)} - R^*(j)$ would equal zero. We do not assume uncovered interest parity.

The government receives revenues based in each foreign currency j, where the revenues are given by $F(j)$ when measured in foreign currency, where $j = 1, \ldots N$. The current value in rupiah of each revenue payment is therefore $e(j)F(j)$. We assume that the foreign currency values of these revenues follow the standard diffusion process given by:

$$\frac{dF(j)}{F(j)} = \eta_j dt + \zeta_j dZ_{f(j)}. \qquad j = 1, \ldots, N$$

where η_j is the expected rate of change and ζ_j is the standard deviation of the rate of change at time t. A method known as Itô's Lemma can be used to derive the diffusion process for the evolution of the rupiah value of the revenues:

$$\frac{d\left[e(j)F(j)\right]}{e(j)F(j)} = \left(\mu_j + \eta_j + \sigma_{fj}\right) dt \; \sigma_j dZ_{e(j)} + \zeta_j dZ_{f(j)}$$

where σ_{fj} is the covariance between the rate of change in the exchange rate j and the current foreign currency value of the revenues.

Now suppose that government expenditure is divided up among K different items, each of which has price $P(i)$ where all prices follow the standard diffusion process form:

$$\frac{dP(i)}{P(i)} = \nu_j dt + \tau_j dZ_{p(i)}. \qquad i = 1, \ldots, K$$

where ν_i is the expected rate of change and τ_i is the standard deviation of the rate of change at time T, and $dZ_{p(i)}$ is a standard Wiener increment. The covariances between the logarithms of the prices are denoted τ_{ij} and the covariances between the logarithms of prices and the N exchange rates are denoted λ_{ij}.

The government maximizes an infinite horizon welfare function over the expenditure on the K different public goods. The government's objective function takes the form:

$$\mathbf{E}_t \int_{s=t}^{\infty} \left\{ \frac{1}{\gamma} \left[c(1)^{\alpha(i)}, \ldots, c(K)^{\alpha(K)} \right]^{\gamma} e^{-\delta s} ds \right\}.$$

where $c(i)$ is government expenditure of type (i), δ is a constant rate of time preference, and $1-\gamma$ is the risk aversion parameter where the welfare function exhibits constant relative risk aversion (CRRA).[19] This formulation implies that the government will always spend the fixed share $\alpha(i)$ out of total expenditure on expenditure of type (i).

The government's flow budget constraint is given by:

$$\begin{aligned} dW &= \underbrace{\sum_{j=1}^{N} b(j)\frac{dH\left(B^*(j)\right)}{H\left(B^*(j)\right)}W}_{\text{Cost savings}} + \Bigg\{ \underbrace{T+RW}_{\text{Local Revenues}} - \underbrace{\sum_{j=1}^{K} P(j)c(j)}_{\text{Expenditures}} + \underbrace{\sum_{j=1}^{N} e(j)F(j)\left[\mu_j+\eta_j+\sigma_{fj}\right]}_{\text{External Revenues}} \Bigg\} dt \\ &\quad + \underbrace{\sum_{j=1}^{N} e(j)F(j)\left[\sigma_j dZ_{e(j)} + \zeta_j dZ_{f(j)}\right]}_{\text{Deviation in External Revenues}}. \end{aligned}$$

where an explanation of each component follow below.

Government net worth.—W is the government's instantaneous nominal net worth (this is not a solvency calculation because it is not based on any present discounted valuation), which will be negative if government's debts exceed its assets at time t and positive otherwise, and $dW > 0$ implies a budget surplus while $dW < 0$ implies a budget deficit.

Cost savings from borrowing abroad.—The term $b(j)$ represents the share of debt in foreign currency j and, as described before, the term $dH\left(B^*(j)\right)/H\left(B^*(j)\right)$ represents the cost savings (or losses) of borrowing in currency j as opposed to the domestic currency.

Government revenues from domestic sources.—We assume that the government receives a fixed level of tax revenue from domestic sources of amount T. This flow could be changed to follow a stochastic process if desired. However, we assume that rupiah tax revenues are constant.

Government debt service payments.—Assuming that the government has negative net worth (which is both realistic and usually optimal), unadjusted payments on the stock of debt (equal to $W < 0$) are equal to the domestic interest rate R times the stock of debt $-W$. Of course, not all government debt is held in the domestic currency. However, the cost savings term discussed above provides exactly the right adjustment to account for borrowing in the other currencies.

Government expenditures.—Government expenditures across the K different public goods are represented by the next term $\sum P(j)c(j)$.

[19] In other words, $1-\gamma$ is equal to $\frac{-U''C}{U'}$ where $\gamma < 1$.

Government revenues from foreign currency-denominated sources.—Finally, government revenues from foreign currency sources must be included in terms of both their mean growth and the variation of that growth.

Government net cashflow.—Government net cashflow is therefore equal to government revenue from domestic and foreign sources minus expenditures and debt service payments adjusted for cost savings (due to diversification across currencies).

We assume that the budget is sustainable on average. The government's only tool for hedging is the composition of its debt across the N different currencies. Some new terminology must be introduced in order to write down the solution to the optimization problem.[20] First, ν is the $N \times 1$ vector of cost savings from borrowing in foreign currencies. The term $\mathbf{V_{ee}}$ is the $N \times N$ variance-covariance matrix of the cost savings on the N different foreign bonds which is equal to the variance-covariance matrix of the N exchange rates (because the cost savings are perfectly correlated with the exchange rates). Likewise, the term $\mathbf{V_{es}}$ is the $N \times (K + N)$ variance-covariance matrix of the cost savings (i.e., changes in the exchange rates) with the logarithms of the K exogenous prices and the N exchange rates. Finally, the term $\mathbf{V_{ef}}$ represents the $N \times N$ variance-covariance matrix of exchange rate changes with changes in the domestic currency values of foreign currency revenues. The $N \times 1$ vector, $\mathbf{ef}$, represents the current rupiah value of each of the foreign currency-denominated payments.

The solution for the optimal debt portfolio is:

$$\mathbf{b}W = \underbrace{\left(\frac{1}{1-\gamma}\right)\mathbf{V_{ee}}^{-1}\nu[W]}_{\text{Speculative Portfolio}} - \underbrace{\mathbf{V_{ee}}^{-1}\mathbf{V_{ef}}\ \mathbf{ef}}_{\text{Hedge Portfolio 1}} + \underbrace{\left(1-\frac{1}{1-\gamma}\right)\mathbf{V_{ee}}^{-1}\mathbf{V_{es}}\left|\begin{matrix}\alpha \\ \mathbf{0}\end{matrix}\right|W}_{\text{Hedge Portfolio 2}}$$

where $\mathbf{0}$ is an $N \times 1$ vector of zeros.

5.3 The Speculative Portfolio

The first component of the optimal debt portfolio is the "mean-variance" speculative portfolio. In the context of a profit-seeking investor, this speculative portfolio (known as the mean-variance portfolio) would be the portfolio that promises the highest return for a given amount of risk (or the lowest risk for a given return). It depends on several factors, most notably the degree of risk aversion of the investor. The higher the risk-aversion component, $1-\gamma$, the lower the share of investment in this portfolio will be. In the context of a government seeking to optimize debt holdings, the speculative portfolio is the debt portfolio that minimizes the cost of borrowing for a given level of risk. The difference

[20] See Stulz (1984) for a full description of the solution.

between an investor and a borrowing government is that the former takes a positive asset position on average whereas the latter takes a negative asset position. However, it is theoretically possible for each to take a combination of positive and negative positions in different types of assets within the speculative portfolio.

As Claessens argues, the pure speculative portfolio usually requires extreme investment positions, usually concentrating investment in one asset at the expense of the others. For a government that holds debt, this implies that the speculative portfolio would concentrate borrowing exclusively in one type of bond. The margin for error is very small when such extreme positions are under consideration, and for this reason the optimality of the speculative portfolio is extremely sensitive to changes in the underlying parameters. In studies where the speculative portfolio is calculated and its forward ("out of sample") performance is evaluated, the portfolio usually has performed very poorly suggesting that great caution needs to be taken when deciding on the weight to be applied to this kind of portfolio. Claessens even suggests that prudent governments should place a zero weight on the speculative portfolio.

5.4 The Composite Hedging Portfolio

There are two basic sources of risk to hedge against, changes in foreign currency-denominated revenues and changes in the price of government expenditures (which could be related to commodity price changes). Separate composite hedging portfolios will apply to each and so we will treat each one separately.

5.4.1 Hedging against Changes in Foreign Currency-denominated Revenues

The portfolio designated *Hedging Portfolio 1* represents the optimal composite portfolio for neutralizing risk in foreign currency-denominated revenues. It is independent of the degree of risk aversion and composed of N different portfolios (each one optimized to reduce risk on a specific foreign revenue payment). These N different portfolios are combined in a weighted average where the weights are given by the relative size of payments in that currency. Overall, this portfolio can neutralize the risk stemming from volatility in foreign currency repayments only to the extent that the exchange rates are correlated with the foreign-currency values of the foreign currency revenues or, in other words, to the extent the the foreign currency payment risk is "spanned" by the available portfolio of foreign bonds.

5.4.2 Hedging against Commodity Price-driven Fluctuations in Government Expenditures

The portfolio designated *Hedging Portfolio 2* works pretty much the same way, although it is also a function of the degree of risk aversion. For high levels of risk aversion, a full weight of one will be placed on this hedging portfolio. There are K different hedging portfolios, one portfolio to hedge against the specific risk associated with each of the K different types of expenditures independently (the vector $\mathbf{0}$ truncates the variance-covariance matrix to restrict it solely to terms related to the K different expenditure prices). The overall hedging portfolio is a weighted average of all K portfolios, with the weights determined by the vector α, which represents the shares of each type of expenditure out of the total budget. As with the first hedging portfolio, the usefulness of this hedging portfolio is tied to its ability to neutralize "to a certain extent" the impact of fluctuations of commodity prices on the government's overall expenditure, thereby providing a certain degree of insurance against risk.

5.4.3 Simplifying Further

If we limit the exercise to a single foreign currency (say, the US dollar) such that the only foreign currency-denominated debt service payments are denominated in dollars, and foreign borrowing will only take place in dollar denominated bonds, the demand for dollar denominated bonds will be:

$$bW = \underbrace{\left(\frac{1}{1-\gamma}\right)\left[\frac{R-R^{*}-\nu_{e}}{\sigma_{e}^{2}}\right][W]}_{\text{Speculative Portfolio}} - \underbrace{\left[\frac{\sigma_{e}^{2}+\sigma_{ef}}{\sigma_{e}^{2}}\right] ef}_{\text{Hedge Portfolio 1}} + \underbrace{\left(1-\frac{1}{1-\gamma}\right)\frac{\mathbf{V_{es}}}{\sigma_{e}^{2}}\left|\begin{matrix}\alpha\\ \mathbf{0}\end{matrix}\right| W}_{\text{Hedge Portfolio 2}}$$

The minimum variance hedge, given by *Hedge Portfolio 1* is: $b^{Hedge1}W = -\left(\left[\sigma_{ef}+\sigma_{e}^{2}\right]/\sigma_{e}^{2}\right)ef$. This formula indicates that the amount of borrowing in US dollars should equal the expected amount of US dollar debt service payments *only when* σ_{ef} *is zero*. Otherwise, the adjustment factor $\left(\sigma_{ef}+\sigma_{e}^{2}\right)/\sigma_{e}^{2}$ must be multiplied by the value of the dollar debt service payment to find the optimal share of borrowing in US dollars.

5.5 Using Regression Estimation to Implement this Framework

As stated above, the speculative portfolio is very sensitive to parameter values on account of its tendency to generate extreme portfolios. For ways of attempting to estimate the mean cost savings as well as to account for fluctuations in the key variance-covariance ma-

trixes themselves, see Claessens (1988, pp. 28-32).[21] The means described usually require significant amounts of data and a stable economic regime stretching back sufficiently to provide enough degrees of freedom for estimation. For this reason, they are unlikely to be very helpful.[22] We focus on the simpler method of using ordinary least squares (OLS) regressions.

First, consider expenditures. Regress the log difference (that is, the difference in the logarithms between two adjacent periods) of government expenditures on the log difference of the IDR/USD exchange rate e_t, using a different regression for each type of government expenditure. We use the log difference because it is equal to the percentage change in the variable in question. Thus, the equation below essential regresses the percentage change in government expenditures of type i on the percentage change in the IDR/USD exchange rate:

$$[\ln c(i)_{t+1} - \ln c(i)_t] \quad = \quad \xi^{c(i)} + \beta^{c(i)} [\ln(e_{t+1}) - \ln(e_t)] + \varepsilon^{c(i)}. \tag{1}$$

where $\xi^{c(i)}$ is the constant of regression, $\beta^{c(i)}$ is the slope coefficient, and $\varepsilon^{c(i)}$ is the random error term (assumed to be normally distributed [iid]). The coefficients $\beta^{c(i)}$ are given by:

$$\beta^{c(i)} \quad = \quad \frac{\text{cov}(\Delta c(i), \Delta e)}{\text{var}(\Delta c(i))}.$$

where $\Delta x(i)$ stands for the difference in $x(i)$ between periods t and $t+1$. Because $\beta^{c(i)}$ measures the sensitivity of government expenditures of type i with respect to fluctuations in the IDR/USD exchange rate using the variance-covariance matrix between tax revenues and the exchange rate, the weighted average of the coefficients, $\alpha' \cdot \beta^{\mathbf{c(i)}}$ (where the weights are given by the α shares) gives us a measure of the share of the debt portfolio that should be denominated in USD *if it is negative and if fluctuations in expenditures were the only source of uncertainty*. The implications of a positive coefficient are discussed below.

For more than one exchange rate, the simple regression framework can be extended to a multivariate framework, with all desired exchange rates and other macroeconomic variables that are thought to be important as independent variables. Focusing exclusively on exchange rates, we estimate the following regression:

$$[\ln c(i)_{t+1} - \ln c(i)_t] \quad = \quad \xi^{c(i)} + \sum_{j=1}^{N} \beta^{c(i,j)} [\ln(e(j)_{t+1}) - \ln(e(j)_{t+1})] + \varepsilon^{c(i)}.$$

As above, we take a weighted average of the $\beta^{c(i,j)}$'s using the α shares as the weights. This gives us portfolios shares for each currency, but these shares may need to be re-scaled so that they add up to one.

[21] For example, one can use the Autoregressive Conditional Heteroskedasticity (ARCH) estimator to estimate future values of the variance-covariance matrix. See Kroner and Claessens (1989).

[22] See Claessens 1992, and Kroner and Claessens 1989 for attempts to implement more sophisticated approaches to specific countries, including the Indonesian economy of the 1980's.

So far, we have focused exclusively on regressions of expenditures despite introducing many other variables in the theoretical framework. Separate regressions should be run for different revenue sources (or debt service payments) as well. A weighted average of the expenditure coefficients (where the weights are determined by the share of these expenditures out of total expenditures) should be subtracted from a weighted average of the revenue coefficients in order to determine the coefficient on the net cashflow. A positive composite coefficient is required for holding dollar-denominated debt, and the magnitude of the coefficient should indicate the portion of total debt that should be dollar-denominated.

In addition, the influence of commodity prices on the budget could be introduced. If exchange rates are at least partially coordinated with commodity prices, then a careful choice of the debt portfolio can be used to hedge against risk in commodity prices.

A practical problem is that economic regressions require time series data that covers a period long enough to generate statistically significant results. It is equally important to be reasonably sure that no large structural breaks have taken place over this period, and that the estimated parameters are valid. For Indonesia, the past seven years have been particularly eventful and include a financial crisis and political upheaval. To some extent, the volatility in Indonesia's bilateral exchange rates over the past seven years may be seen as representative of a worst case scenario, and including crisis years would be prudent.

5.6 Estimation Results

Equation 1 was estimated using data on revenues and expenditures from 1996 through 2003. Although this is a short time series, the IDR/USD exchange rate followed a crawling peg (with annual depreciation of approximately 5 percent per year, although there were some episodes of exchange rate realignment) prior to 1997, so much of the variation in the exchange rate comes from the period we examine.

The interpretation of the coefficients is as follows. A positive coefficient on a regression of the log difference (that is, percentage change) of revenues on the log difference (percentage change) of the IDR/USD exchange rate implies that as the rupiah depreciates, revenues increase. This would be the case if a portion of government revenues are derived from dollar-denominated sources. At the same time, a depreciation of the rupiah would increase the rupiah burden of repaying dollar-denominated debt. This should not be as much of a concern because the governments rupiah-denominated revenues are increasing along with the rupiah-denominated debt burden. If the rupiah appreciates instead, a positive coefficient from the regression implies that the government's rupiah-denominated revenues are declining, but so is the government's rupiah debt service burden on dollar-denominated debt. Thus, a positive coefficient implies that the government should hold

a certain portion of its debt in dollar-denominated bonds (that is, the government should hold dollar-denominated liabilities), where the percentage is given by the size of the coefficient. A *negative* coefficient would imply that the government should hold a certain amount of dollar-denominated assets (as opposed to liabilities) instead.

On the expenditure side, a positive coefficient of the log difference (that is, percentage change) of expenditures on the log difference (percentage change) of the IDR/USD exchange rate implies that as the rupiah depreciates, expenditures increase. If imports of foreign equipment make up a significant fraction of the government's expenditures, we would expect a positive coefficient from this regression. However, as the rupiah depreciates, the burden of repaying dollar-denominated debt increases at the same time as the burden of these other expenditures if the regression coefficient is positive. Thus, a positive coefficient implies that the government should hold a certain amount of dollar-denominated *assets* and not hold foreign debt. Only a negative coefficient would imply that foreign debt is optimal for the expenditure side.

Of course, in order to determine the optimal debt position with respect to the government's *net cashflow*, we must subtract the coefficient from the expenditure side from the coefficient on the revenue side. If this coefficient is positive, it would imply that a portion of sovereign debt should dollar-denominated. If this coefficient is negative, however, the government should hold no dollar-denominated debt and instead should hold dollar-denominated assets.

We use data on different types of revenues and expenditures in the regressions below. From the revenue side, we selected oil & gas income taxes and international trade taxes, as well as total revenues.[23] The expenditure categories we tested include: personnel expenditures, material expenditures, transfers to regions, domestic interest payments, external amortization payments, external interest payments, petroleum subsidies, other current expenditures, and development expenditures. Of these categories, only domestic interest payments, foreign interest payments, and petroleum subsidies had statistically significant coefficients.

In selecting the proper exchange rate series, note that prior to 2000, the government fiscal budget ended in March, and so the proper end-of-period exchange rate is the March exchange rate. The 2000 year budget was a 9-month budget which we annualize by multiplying by a factor of 4/3. For 2000 through 2003, the appropriate end-of-period exchange rate is the December exchange rate.

[23]Due to time constraints, other important revenue categories were left untested. Future work could address these omissions.

Table 1:
OLS Estimation Results for Revenues

Dependent variable is given at the the top of each column. Independent variable is **always** the log difference of the IDR/USD exchange rate.				
	Oil & Gas Income Taxes	International Trade Taxes	Total Revenues	Weighted Average
Regression #	(1)	(2)	(3)	
Regression Coefficients				
β	0.315	0.552	0.133	
(t-statistic)	(1.368)	(2.052)	(1.353)	
Significance	***	***	**	
Weights				
Case 1	0.10	0.04	–	**0.05**
Case 2	–	–	1.00	**0.13**

Note: This table reports estimated coefficients from variations on regression equation (1). Significance is designated as follows: (...) — completely statistically insignificant, (**) — weakly statistically significant, and (***), — strongly statistically significant. See text for further details.

5.6.1 Revenues

The results for the revenues are presented below in Table 1. We have chosen two cases to illustrate as follows. The first case concentrates only on revenue categories that are believed to be significantly related to the IDR/USD exchange rate, namely, oil & gas income taxes and international trade taxes. Both generate statistically significant results. The second case simply regresses total revenues on the exchange rate. The weights given in Case (1) are the average shares of revenue for each categories from 1996–2003. The weight on total revenues in Case (2) is of course one.

The weights are multiplied by the β coefficients to get the weighted coefficients. For Case (1), the relatively high β values are tempered by the low weights for each category. For example, considered in isolation, the coefficient on oil & gas income implies that to hedge against risk stemming solely from fluctuations in this category of revenue, 32 percent of debt should be dollar-denominated. The weighted average of 0.05 in Case 1 implies that only 5 percent of debt should be dollar-denominated. Case 2 implies that 13 percent of debt should be dollar denominated. Of course, revenue is only one-half of the net government cashflow. We turn now to expenditures.

Table 2:
OLS Estimation Results for Expenditures

Dependent variable is given at the the top of each column. Independent variable is **always** the log difference of the IDR/USD exchange rate.					
	Domestic Interest Payments	External Amortization Payments	External Interest Payments	Petroleum Subsidies	Weighted Average
Regression #	(1)	(2)	(3)	(4)	
Regression Coefficients					
β	1.089	0.325	0.616	0.903	
(t-statistic)	(3.629)	(0.479)	(2.520)	(1.075)	
Significance	***	...	***	*	
Weights					
Case 1	0.05	0.00	0.10	0.07	**0.18**
Case 2	0.05	0.13	0.10	0.00	**0.16**
Case 3	0.05	0.13	0.10	0.07	**0.22**

Note: This table reports estimated coefficients from variations on regression equation (1). Significance is designated as follows: (...) — completely statistically insignificant, (**) — weakly statistically significant, and (***), — strongly statistically significant. See text for further details.

5.6.2 Expenditures

The results for expenditures are presented below in Table 2. We have chosen three cases to illustrate as follows. The first case concentrates only on expenditures that, when regressed on the IDR/USD exchange rate, generate statistically significant results. Thus, Case (1) includes only domestic and external interest payments, and petroleum subsidies. Case (2) includes domestic interest payments, external interest payments, and external amortization payments. Case (3) includes all of the expenditure types from Case (2) plus petroleum subsidies. In each case, the weights that are not set to zero are kept at their average levels implying that the weights in each case do not sum to one. The interpretation is that the remaining weight is implicitly multiplied by zero, as the other expenditures are unrelated to exchange rate fluctuations.

The final column displays the weighted average of the regression coefficients for the expenditure side alone. Case (1) implies that the Indonesian government should hold dollar-denominated *assets* worth 18 percent of the debt portfolio. Case (2) implies that dollar-denominated assets worth 16 percent of the debt portfolio should be held, and Case (3) implies that dollar assets should be adjusted to equal 22 percent of the debt portfolio.

5.6.3 Net Cashflow

To find the debt portfolio recommendations for the entire net cashflow, we must subtract the composite coefficient of choice on the expenditure side from the composite coefficient of choice on the revenue side. Using Case (2) from the Table 1 and Case (2) from Table 2, this calculation is:

$$\beta^{Rev} - \beta^{Exp} \quad = \quad 0.13 - 0.16 = (-)0.03.$$

which implies that, in order to hedge against risk in the its net cashflow, the government should hold foreign assets worth 3 percent of its stock of foreign debt. The other cases can be calculated accordingly.

It should be stressed that these results are very preliminary. Further refinement of the regressions is needed in terms of the number of years included, selection of crisis and post-crisis periods for evaluation, quality of the data, and the inclusion of other subcategories of revenue and total expenditures in the analysis as well as consideration of other exchange rates (especially the IDR/JPY exchange rate) and commodity prices. Preliminary unreported work including the IDR/JPY exchange rate suggests that Indonesia should hold net dollar-denominated assets and maintain a yen-denominated share of debt. Nonetheless, the framework presented here demonstrates the methodology that should be used when considering hedging the government's net cashflow. We turn now to an alternative method of selecting an optimal portfolio that is unrelated to the government's net cashflow.

5.7 A Simple Model in Excel

An alternative method of using the intuition outlined above is to model the sensitivity of the debt portfolio to changes in key macroeconomic variables. The "debt portfolio calculator" is a simple model designed to provide insight into the optimal composition of debt. In its simplest form, it abstracts from many important features of debt management, most importantly the difference between stocks and flows. This approach also ignores any relationship between the cost of borrowing and government expenditures. Rather, it is most closely related to the speculative portfolio discussed above. This omissions do not however prevent the calculator from giving important insights into the tradeoff between achieving the lowest expected cost of borrowing and achieving the lowest risk of borrowing.

Ultimately, the question of how much of a weight should be placed on risk versus on cost is a matter of government preference, that is, the degree of risk aversion that decision-makers have. Prudent policymakers will place a high priority or weight on reducing risk. The calculator allows for different weights to be entered, such that the ideal composition can be determined.

The debt portfolio calculator is a simple Excel spreadsheet that shows the expected cost and overall risk of different combinations of IDR- and USD denominated debt. A debt portfolio is any choice of weights, w_D and w_E, on rupiah-denominated (domestic) and dollar-denominated (external) debt such that the weights sum to one. There are two features that distinguish each portfolio: expected cost and overall risk. In general, there is a tradeoff between the two; expected cost can only be reduced by increasing overall risk. If the covariance between the cost of each type of debt is negative, we are assured that there are benefits to diversification, and debt portfolios that blend the two assets together are less risky than portfolios that consist entirely of one type of debt or the other.

The expected cost of borrowing for any given debt portfolio is:

$$c = w_D c_D + w_E c_E.$$

where the weights are defined above, c is the expected cost of borrowing for the overall portfolio and c_D and c_E are the expected costs of borrowing for domestic and external markets. The risk associated with the debt portfolio is given by:

$$\begin{aligned} \text{var}(c) &= w_D^2 \text{var}(c_D) + w_E^2 \text{var}(c_E) + 2 w_D w_E \text{cov}(c_D, c_E), \\ &= w_D^2 \sigma_D^2 + w_E^2 \sigma_E^2 + 2 w_D w_E \sigma_D \sigma_E \rho. \end{aligned}$$

where σ_D is the standard deviation of the cost of borrowing in rupiah markets (σ_D^2 is therefore the variance), σ_E is the standard deviation of the cost of borrowing in dollar markets (σ_E^2 is therefore the variance), and ρ is the correlation coefficient between the two different costs of borrowing.

Determining these covariances is the most important part of the procedure, and to do this we make some simplifying assumptions. The strongest of these assumptions is that debt matures instantaneously, so that the cost of each type of debt is fully captured by the instantaneous interest rates. This assumption sidesteps capital gains and losses that are related to longer maturities. Building these factors into the analysis would be a useful extension. We assume that the returns paid by the government on each type of debt are as follows:

$$\begin{aligned} c_D &= r_D(t) = r_{\text{SBI}}(t), \\ c_E &= r_E(t) = r_W(t) + \theta(t) + \frac{\dot{e}(t)}{e(t)}. \end{aligned}$$

where r_E is the rupiah interest rate on external debt, r_W is the dollar interest rate on external debt, θ is the risk premium on Indonesian debt, $\dot{e}/e$ is the rate of depreciation of the IDR, r_D is the domestic interest rate, and r_{SBI} is the interest rate on SBIs. The second equation is similar to an uncovered interest rate parity condition. Both equations are linked due to relationships between the right-hand-side variables of each. For example,

both the SBI interest rate and the rate of IDR depreciation are functions of domestic inflation. The SBI interest rate is also likely to be influenced by the world interest rate and the risk premium. In any case, we do not need to be too sophisticated about the interactions for the simple exercise of determining fluctuations in these variables. We need merely to create historical series for the (unobserved) left-hand-side variables (or better yet, careful projections) and determine their variance-covariance structure.

In the exercise reported below, we use the average projected interest rates on external and domestic debt from the MOF's planning budget in all cases. We differentiate between two different scenarios for the covariances however. The first scenario uses quarterly post-crisis data on the variables listed above for the years 1999–2003. We assume that the cost of domestic debt is determined solely by the one-month SBI rate, whereas the cost of external debt is the sum of *previous* depreciation plus the world interest rate.[24] This backward-looking approach to depreciation, known as "adaptive expectations" has been strongly criticized for failing to capture rational expectations about *future* exchange rates. Scenario 2 alters the approach of Scenario 1 by using one-quarter-ahead rates of depreciation for the calculation of the cost of external debt.[25] Finally, Scenario 3 follows the approach of Scenario 2, but extends the analysis through the longer time span, 1997–2003.

The various cases are given in Table 3 where the IDR- and USD-weights are given in columns (3) and (4). The debt portfolio (5) gives equal shares to both types of debt, whereas portfolio (1) consists entirely of IDR-denominated debt and portfolio (8) consists entirely of USD-denominated debt. Portfolios (2) through (4) and (6) through (7) examine other intermediate combinations.

The results clearly demonstrate the tradeoff between cost and risk. In every case, the portfolio with the lowest expected cost is weighted 100 percent in dollar-denominated debt. However, the least-risk portfolio varies across scenarios. In Scenario 1, the least-risk portfolio should be split 90 percent in rupiah-denominated debt and 10 percent in dollar-denominated debt. In Scenario 2, the split is 80 percent and 20 percent respectively, while in Scenario 3, a 65 percent weight on rupiah debt versus a 35 percent weight on dollar debt provides the least risk.

Which debt portfolio should be chosen? The answer depends on several factors. First, the MOF's degree of risk aversion will determine how much emphasis is placed on cost as opposed to risk. The more risk averse policymakers are, the higher the weight will be placed on the diversified portfolios. Second, the degree to which the MOF wants to

[24]We lack a good measure of the risk premium, and it is difficult to separate out a pure risk premium from the depreciation variable.

[25]The wide fluctuations in exchange rates cause sharp movements in the calculated cost of external financing. To bring these costs more into line with perceptions, we use a three-quarter centered moving average of the calculated external financing costs in calculating our final results.

plan for another financial crisis will determine which of these scenarios will carry the greatest influence. The third scenario would be most appropriate for preparing for a new economic crisis as it uses data from the 1997-1998 crisis to determine the variance-covariance structure of the inherent risks, whereas the other scenarios focus more on post-crisis results.

The results presented are mainly suggestive, and by no means conclusive. Ideally, the maturity structure of the debt should be included in the analysis.[26] Moreover, a more sophisticated approach can be taken to identify and quantify the risks inherent in each type of debt. Nevertheless, the framework used for this exercise can hopefully prove to be a catalyst for further refinement of a debt management strategy.

6 Recommendations

The following recommendations are based on the prior analysis and conversations with various market participants. They are speculative and will require greater refinement of the tools discussed in this paper, as well as institutional experience.

6.1 Decide what role CGI borrowing and debt will play in Indonesia's future

Given the large share of Indonesia's debt portfolio that is composed of CGI-related funding, the future of CGI debt in Indonesia's funding strategy is important. CGI debt is attractive in that it carries lower interest rates than those available commercially, and restructuring through the Paris Club is an option if the need arises. However, the currency composition of CGI debt may not be optimal, nor is this debt free from "hidden costs" in terms of indirect subsidies or political sovereignty. Judging from the projections of CGI-related debt through 2010, the MOF anticipates a reduction the role that the CGI will play. If financing through the CGI is cut, it will have to be replaced by funding from other sources. The discussion in this paper has assumed that greater borrowing in the commercial rupiah and dollar sovereign bond markets will be required, and we have tried to identify how an efficient transition to financing from these markets can be made. Nevertheless, a careful analysis of the costs and benefits of making such a transition is recommended as an important component of the developing debt management strategy.

[26] Indeed, a separate analysis can be performed along the lines of this exercise except, instead of focusing on the risks inherent in rupiah- and dollar-denominated debt, the focus can be placed on the risks inherent in the interest rates on short- and long-maturity debt.

Table 3:
Demonstration of the Cost and Risk Tradeoff
for Different Portfolio Choices

Case	Overall Expected Cost of Portfolio	Weight of Rupiah Debt	Weight of Dollar Debt	Variance of Rupiah Cost	Variance of Dollar Cost	Correlation	Overall Portfolio Risk
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Assuming: expected dollar cost: 11.0 %, expected rupiah cost: 8.0 %							
Scenario 1: Adaptive Expectations (1999 – 2003)							
1	11.0 %	1.0	0.0	0.011	0.099	0.231	1.10
2	**10.7 %**	**0.9**	**0.1**	**0.011**	**0.099**	**0.231**	**0.99**
3	10.4 %	0.8	0.2	0.011	0.099	0.231	1.11
4	10.1 %	0.7	0.3	0.011	0.099	0.231	1.44
5	9.8 %	0.6	0.4	0.011	0.099	0.231	1.99
6	9.5 %	0.5	0.5	0.011	0.099	0.231	2.77
7	9.2 %	0.4	0.6	0.011	0.099	0.231	4.97
8	8.0 %	0.0	1.0	0.011	0.099	0.231	9.92
Scenario 2: Rational Expectations (1999 – 2003)							
1	11.0 %	1.0	0.0	0.011	0.093	0.283	1.10
2	**10.4 %**	**0.8**	**0.2**	**0.011**	**0.093**	**0.283**	**1.08**
3	10.1 %	0.7	0.3	0.011	0.093	0.283	1.38
4	9.8 %	0.6	0.4	0.011	0.093	0.283	1.89
5	9.5 %	0.5	0.5	0.011	0.093	0.283	2.61
6	9.2 %	0.4	0.6	0.011	0.093	0.283	3.53
7	8.9 %	0.3	0.7	0.011	0.093	0.283	4.65
8	8.0 %	0.0	1.0	0.011	0.093	0.283	9.27
Scenario 3: Rational Expectations (1997 – 2003)							
1	11.0 %	1.0	0.0	0.005	0.011	-0.497	0.53
2	10.4 %	0.8	0.2	0.005	0.011	-0.497	0.38
3	**10.1 %**	**0.7**	**0.3**	**0.005**	**0.011**	**-0.497**	**0.36**
4	**9.8 %**	**0.6**	**0.4**	**0.005**	**0.011**	**-0.497**	**0.36**
5	9.5 %	0.5	0.5	0.005	0.011	-0.497	0.40
6	9.2 %	0.4	0.6	0.005	0.011	-0.497	0.47
7	8.9 %	0.3	0.7	0.005	0.011	-0.497	0.57
8	8.0 %	0.0	1.0	0.005	0.011	-0.497	1.07

Note: This table reports the expected cost (column 2) and risk (column 8) of eight different debt portfolios consisting of different combinations of IDR- and USD-denominated debt. See text for further details.

6.2 Reduce borrowing costs by "investing" in liquidity in key markets

A consistent lesson from conversations with bond market analysts is that markets for different types of bonds are segmented, and that promoting greater liquidity in these markets can lower borrowing costs. Greater liquidity allows investors to reduce their holdings at greater ease and also allows for the creation of hedging instruments that can lower investors' risks.

The two key market options for liquidity-deepening are the medium- to long-term domestic bond market and the USD external sovereign bond market. We treat the domestic market below, and focus on dollar-denominated commercial debt here. Indonesia currently has very little commercial sovereign debt outstanding, as the majority of its foreign debt exposure is CGI-related. In fact, the only bond that is liquid and traded actively is the recent February 2004 10-year bond. Indonesia will surely find it advantageous to enhance its borrowing options in the dollar bond market, and one important way to achieve this is by filling out the yield curve at all maturities out to 10 years. This deepening along the yield curve can be achieved efficient by borrowing USD 500 million in 5-year bonds and USD 500 million in 10-year bonds on an annual basis. In five years, the goal of filling out the yield curve will be completed.

6.3 Promote greater liquidity in the market for government bonds

There are many benefits to developing a domestic currency-denominated sovereign bond market, including that they: (i) provide an alternative, non-inflationary source of funding, (ii) foster a healthy capital market, (iii) improve the functioning of the financial system, (iv) improve monetary management, (v) enhance transparency, (vi) widen investment opportunities, (vii) ease the benchmarking of corporate sector claims, and (viii) provide a more efficient determination of the time value of money. [27] Unlike the dollar-denominated market in which the quantity of bonds available is a concern, quantity is not a problem in the rupiah-denominated market. Many regulatory reforms that would encourage trading in the secondary market are already underway, such as requiring that all institutions, especially banks, mark-to-market their bond portfolios. To this end, bond market participants are being required to register their holdings and transactions prices with the Surabaya Bourse (Bursa Efek Surabaya), although traders are complaining that the reporting price is too high. Providing more short-maturity instruments to fill out the yield

[27] This list was compiled by CGK (2003).

curve for domestic debt may encourage greater hedging.[28]

6.4 Work with BI to phase in short-maturity treasuries as a replacement for SBIs

One institutional challenge concerning the issuance of short-maturity treasuries is that Bank Indonesia (BI) currently dominates the market for rupiah-denominated short-maturity instruments through the issuances of Sertifikat Bank Indonesia (SBIs). Short-maturity debt issued by the MOF would compete to some extent with SBIs in the local bond market. Alternatively, the MOF could cede the short-end of the maturity structure to BI while the MOF concentrated on building up liquidity on the longer end of the maturity spectrum. Ultimately, it may be more efficient for BI to phase out the use of SBIs and conduct monetary policy more through the use of short-term treasuries than its own instruments.

One of the key weaknesses of the SBI as a monetary instrument is that SBIs must be sold to contract the money supply, but the interest on SBIs expands the money supply because it is funded by money creation. Thus, when the stock of SBIs becomes large and interest rates are high, slowing the growth of base money (or other monetary aggregates) becomes difficult. Short-term treasuries would not be subject to this drawback because the interest on them is not funded by money creation. There is currently a very large amount of liquidity residing in short-term time deposits at various banks that would likely be available for short-maturity treasuries at a low cost. Thus, two goals could be achieved simultaneously: BI would be given some breathing room in lowering the growth rate of base money and obtain a new non-inflationary instrument to work with, and the MOF would obtain low cost funding in the short-term market. Of course, as stressed earlier in this paper, the MOF should not rely too heavily on this form of financing given the dangers associated with having to roll-over too large a stock of debt at any one time.

7 Conclusion

The transition of the GOI's financing structure away from a strict reliance on the CGI towards commercial onshore and offshore bond markets is momentous, and ultimately healthy. This transition needs to be carefully managed, however, and resolving an appropriate debt management strategy is challenging. This paper has concentrated primarily

[28]Unfortunately, one reason for the lack of hedging is that foreign banks are in many cases forbidden by their head offices from undertaking certain types of transactions with local banks. The lack of participation by foreign banks, and by implication their international clients, is a significant problem.

on the currency-composition of borrowing and the determination of the optimal debt portfolio. Efforts to develop the liquidity of Indonesian sovereign debt in key bond markets will be crucial in achieving these optimal borrowing strategies. In any case, the stock of debt cannot be changed overnight, and alterations can only be made at the margins. The MOF has time to gain experience, and to further refine its approach.

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A Figures

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Figure 1: Distribution of Government Debt: Domestic vs. External

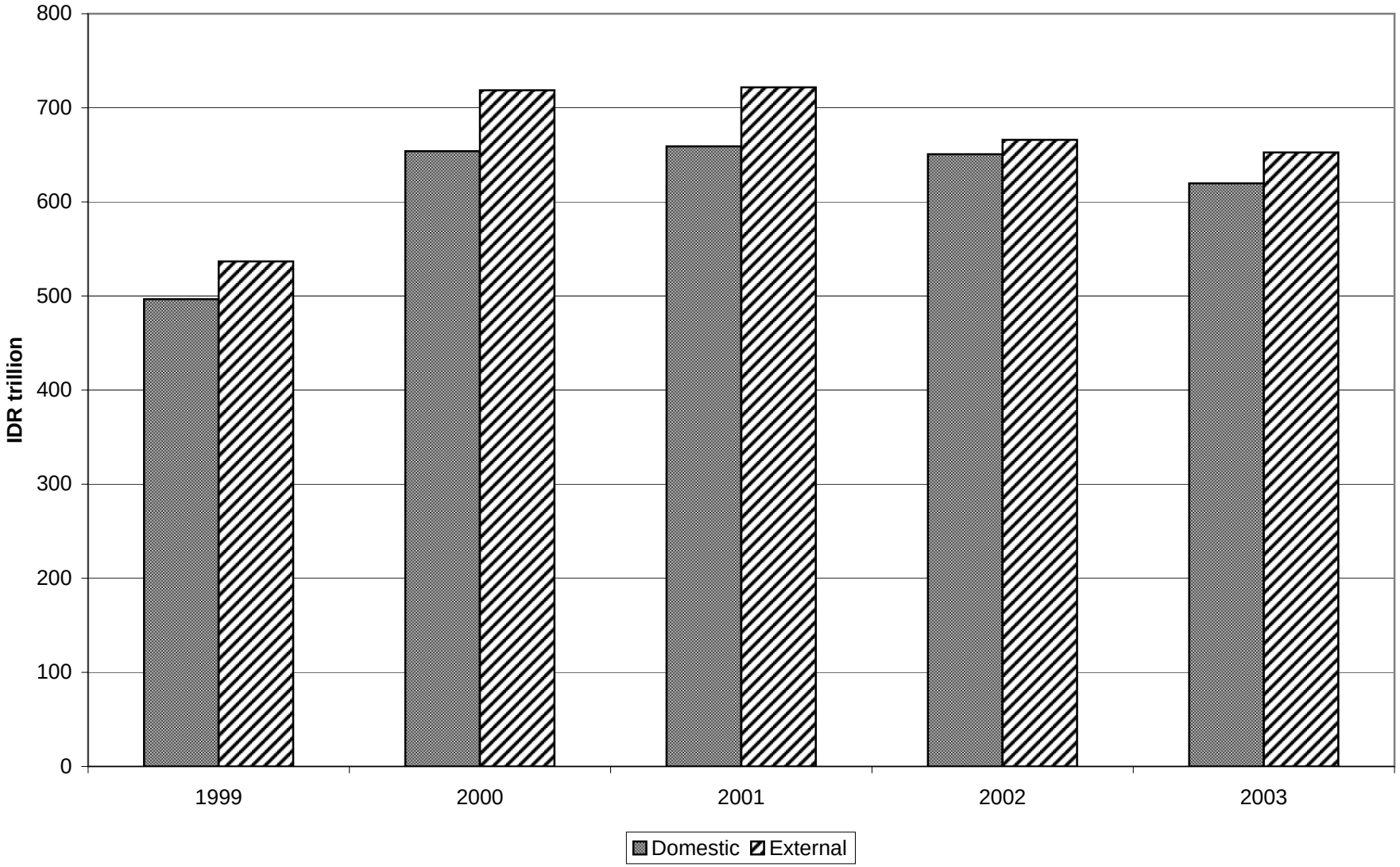

Figure 2: Projected Stock of Outstanding Debt

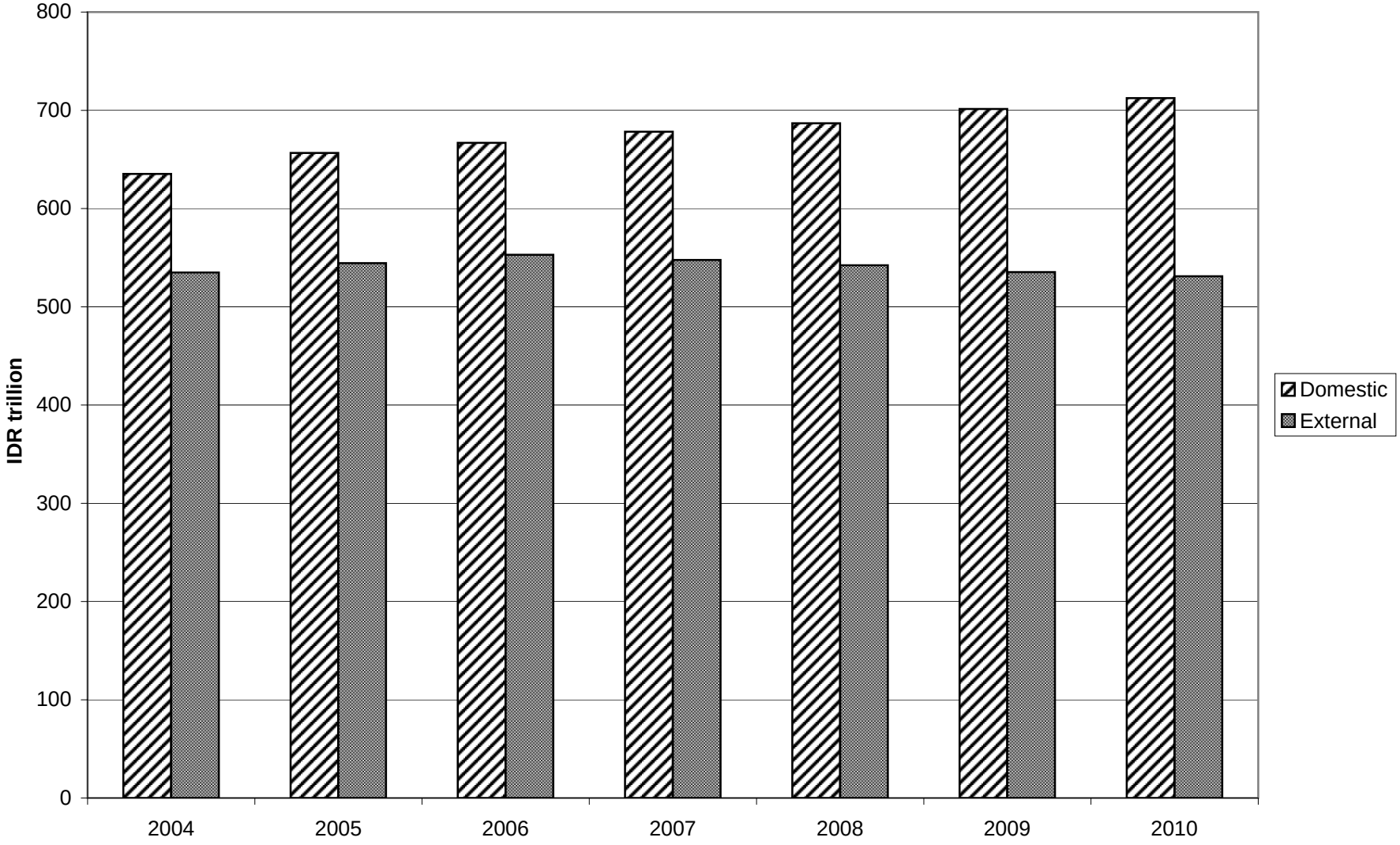

Figure 3: Composition of Government External Debt

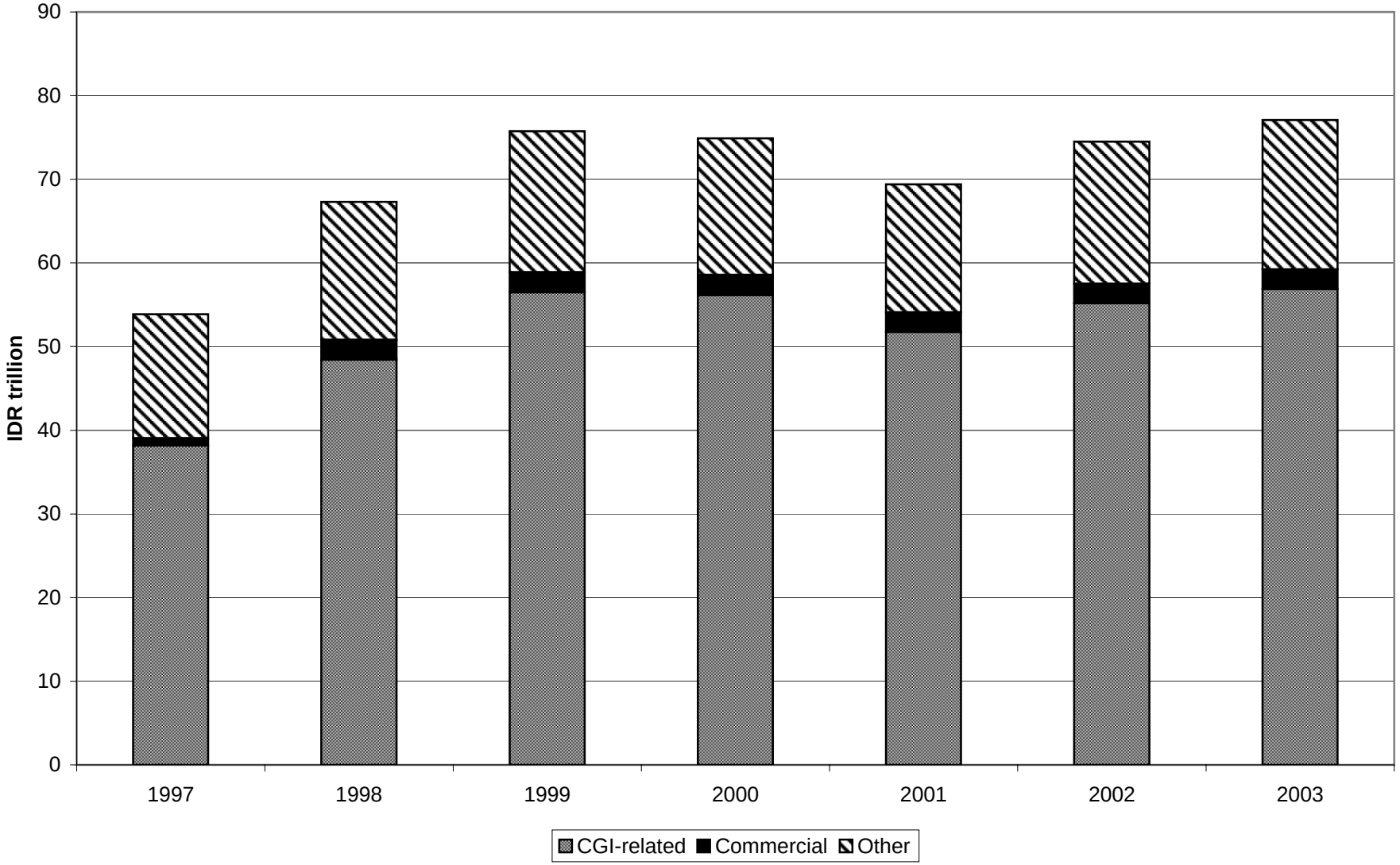

Figure 4: Currency Composition of External Debt

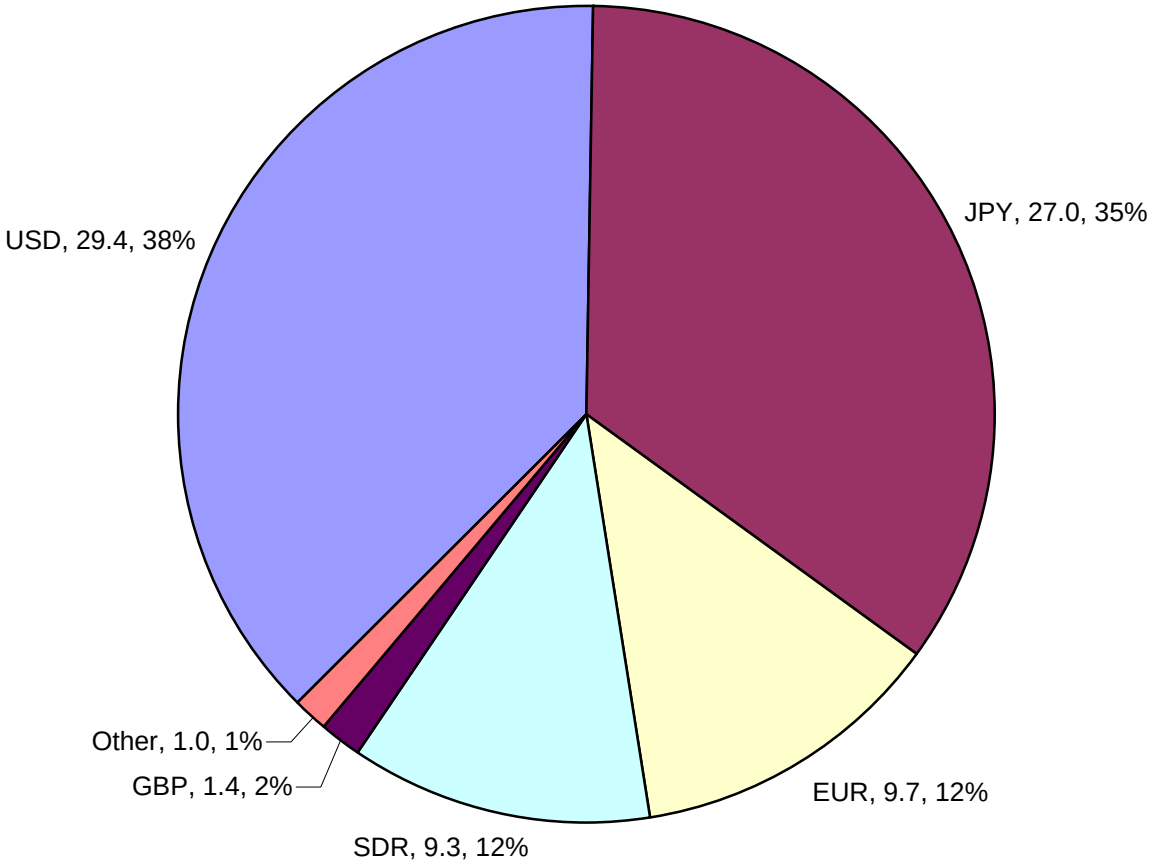

Figure 5: Composition of Domestic Debt

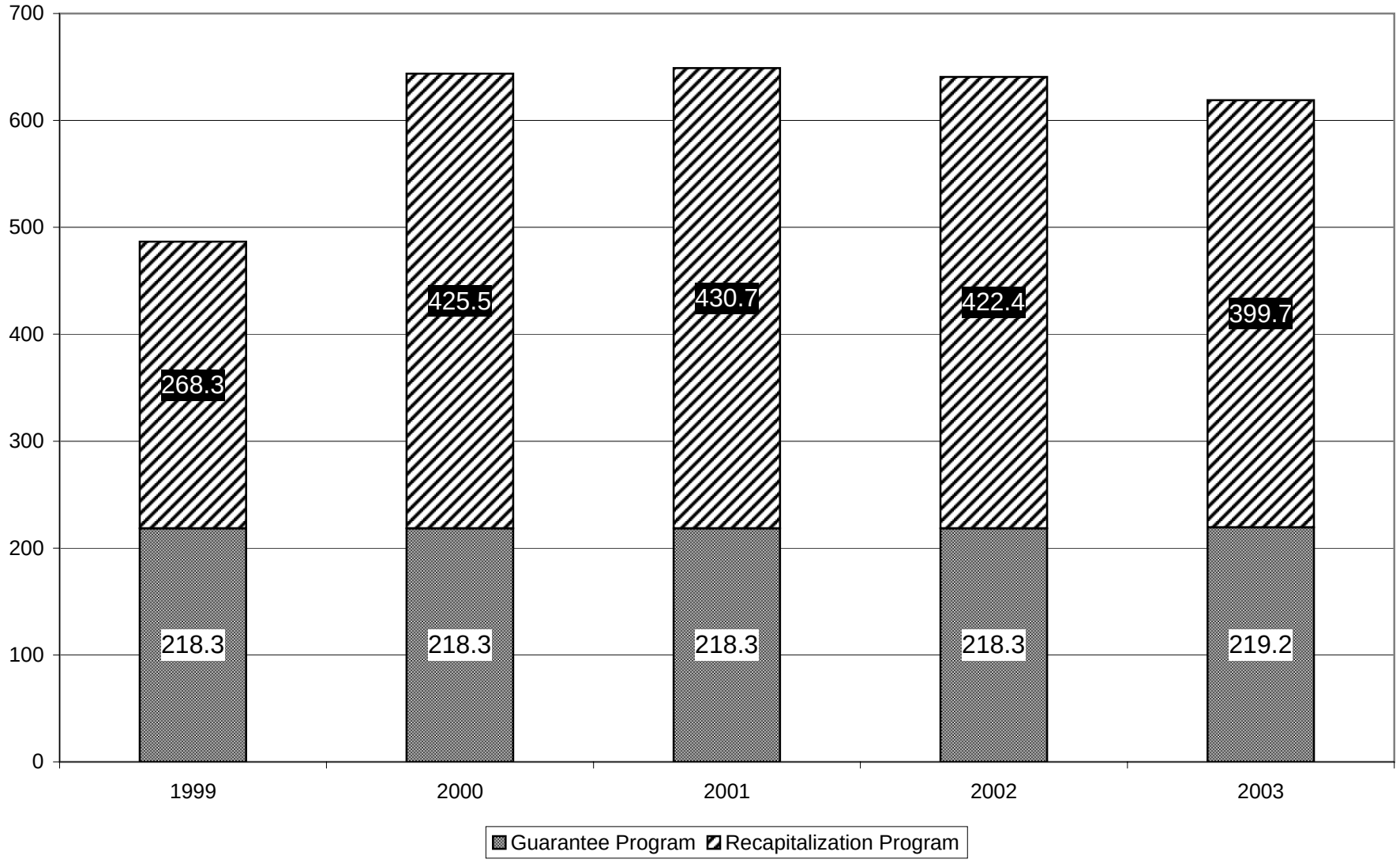

Figure 6: Composition of Recapitalization Bonds

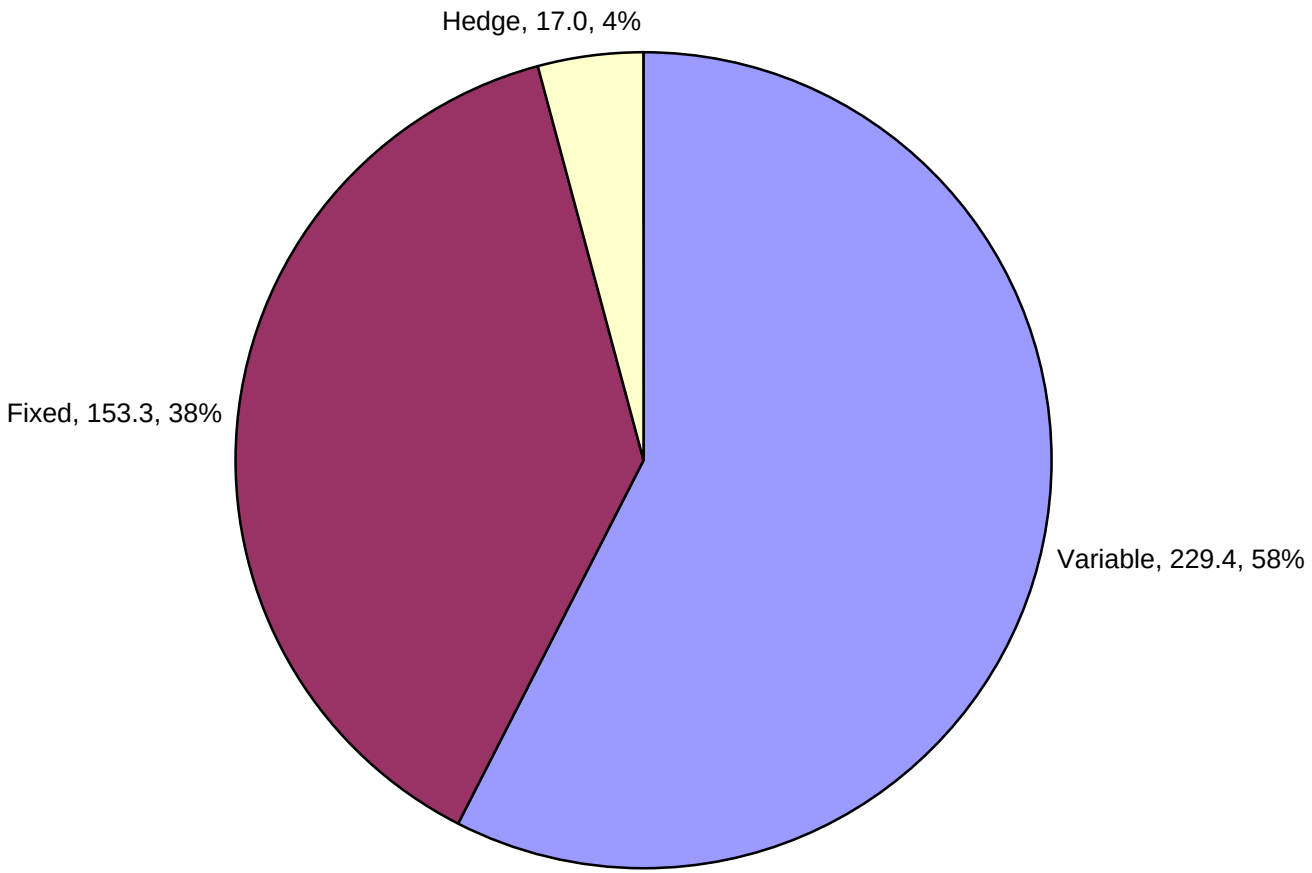

Figure 7: Maturity Profile of Government Debt

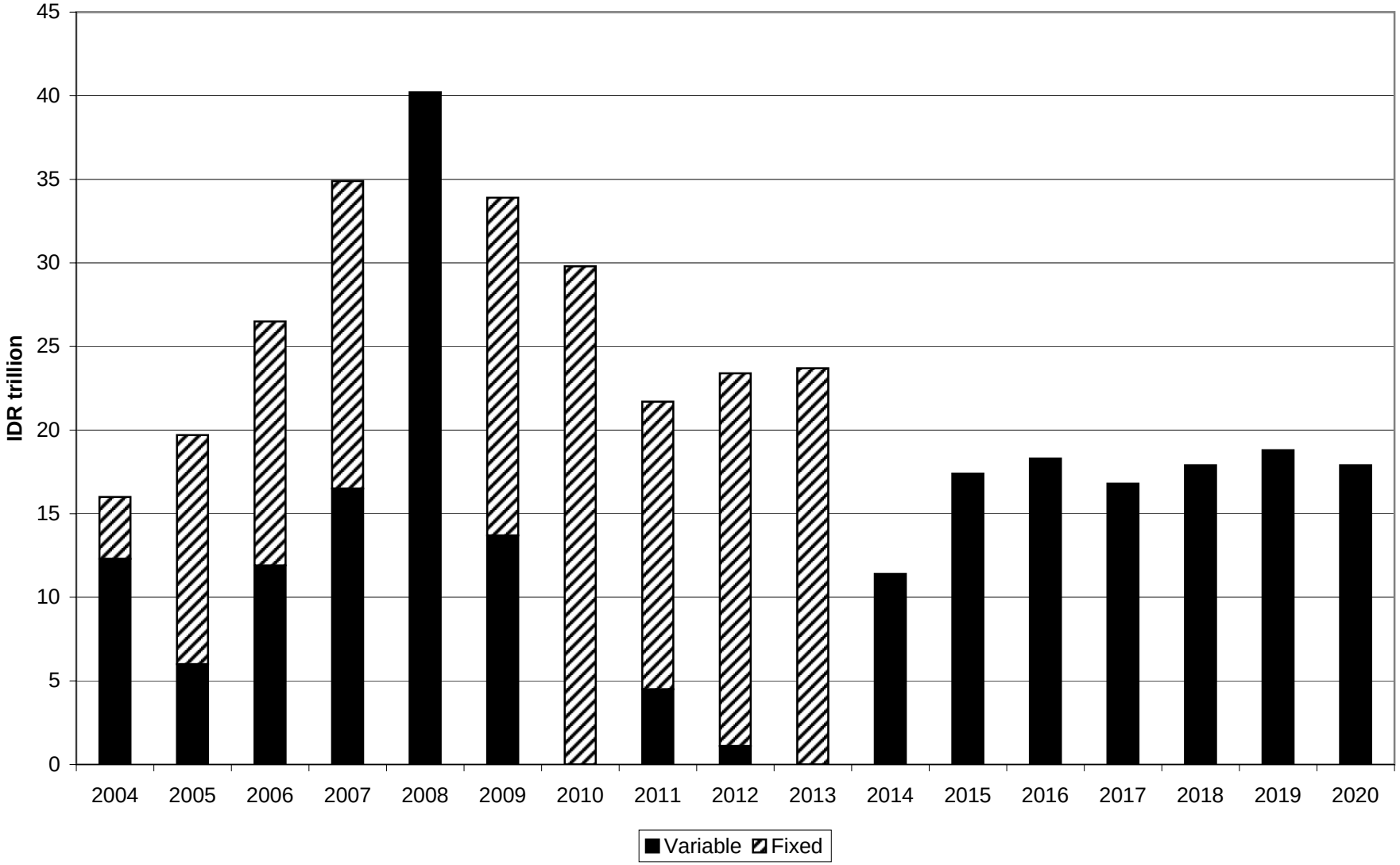

Figure 8: Projected Government Revenues and Expenditures

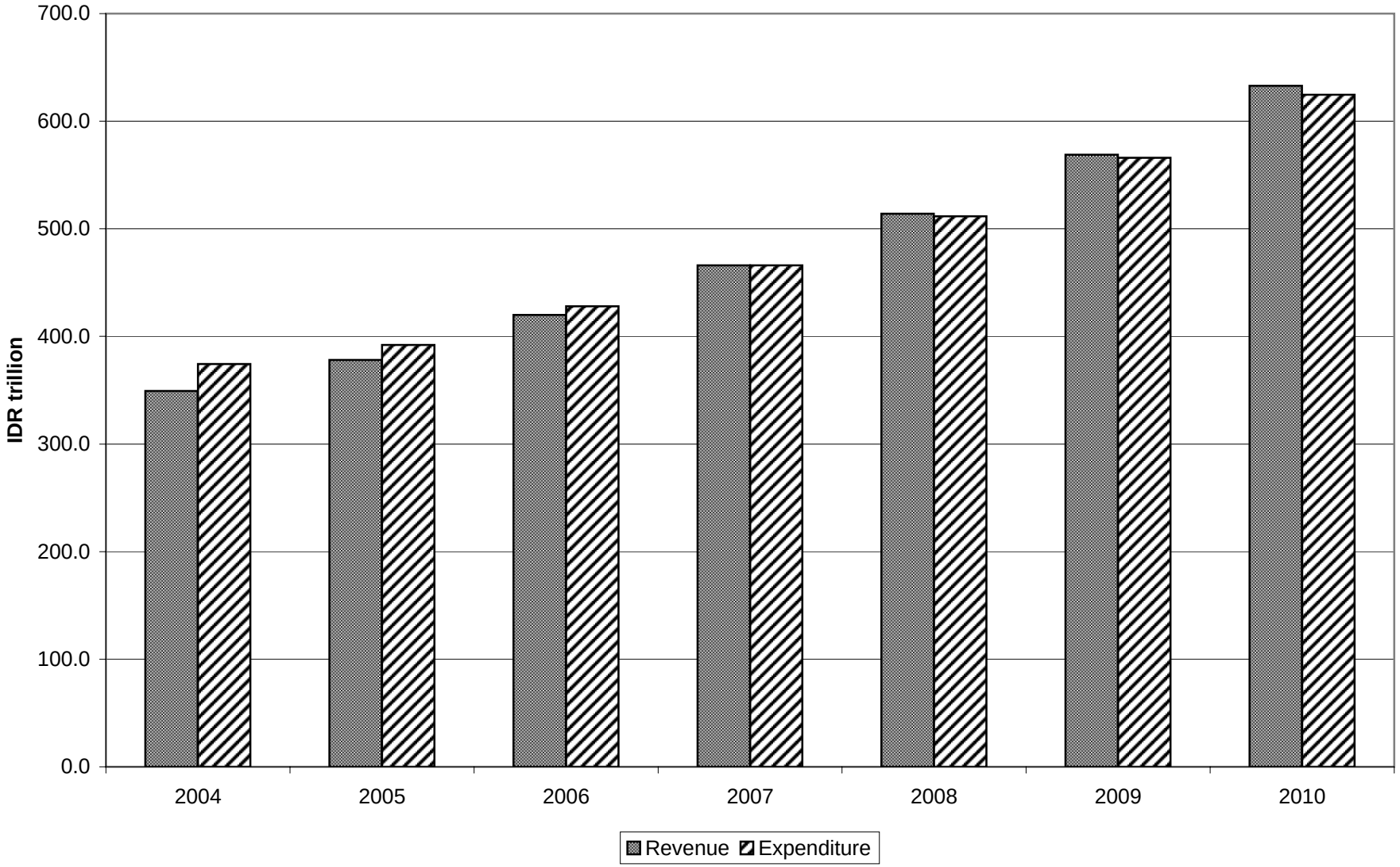

Figure 9: Projected Budget Deficit

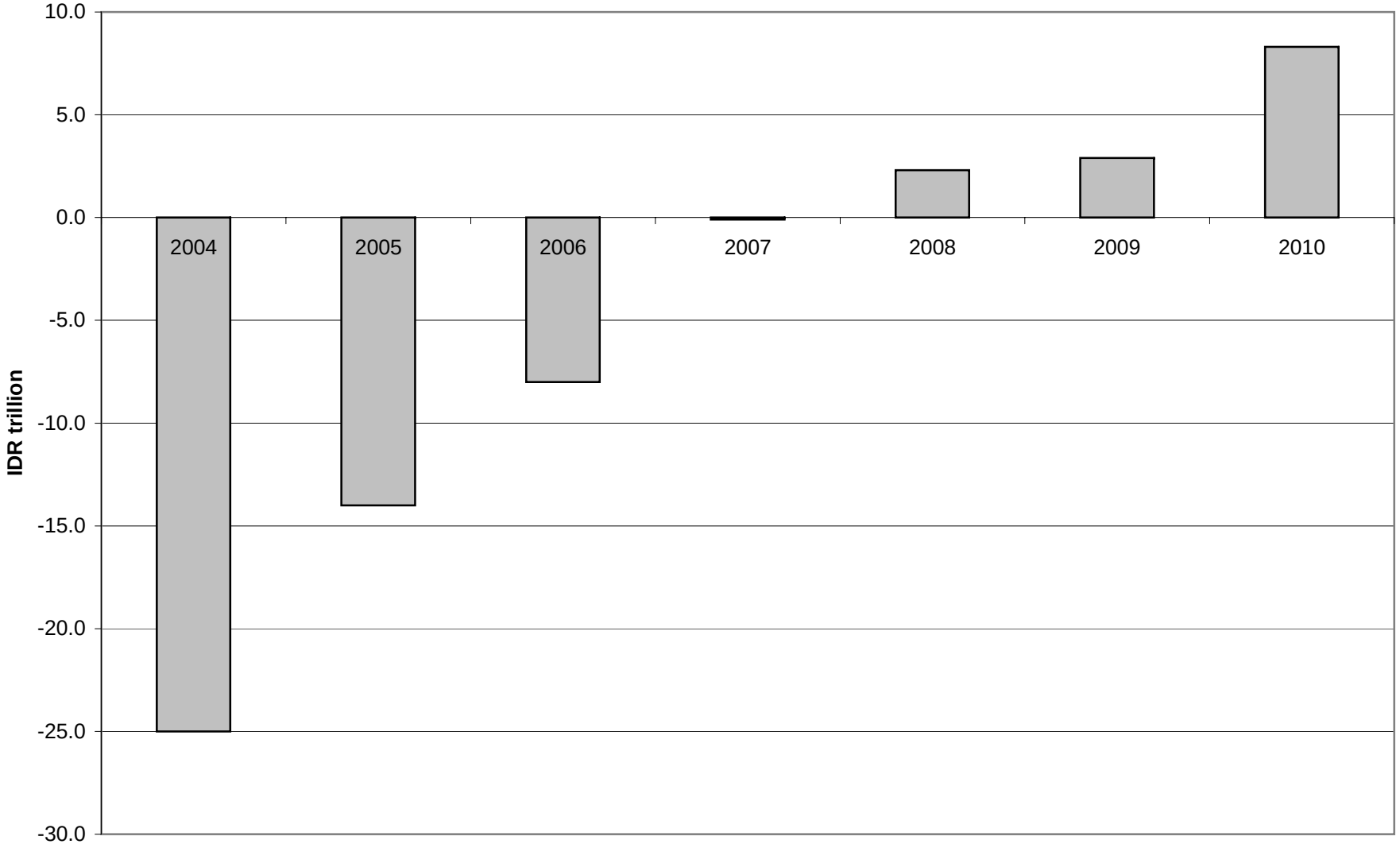

Figure 10: Asset Sales from Privatization and Asset Recovery

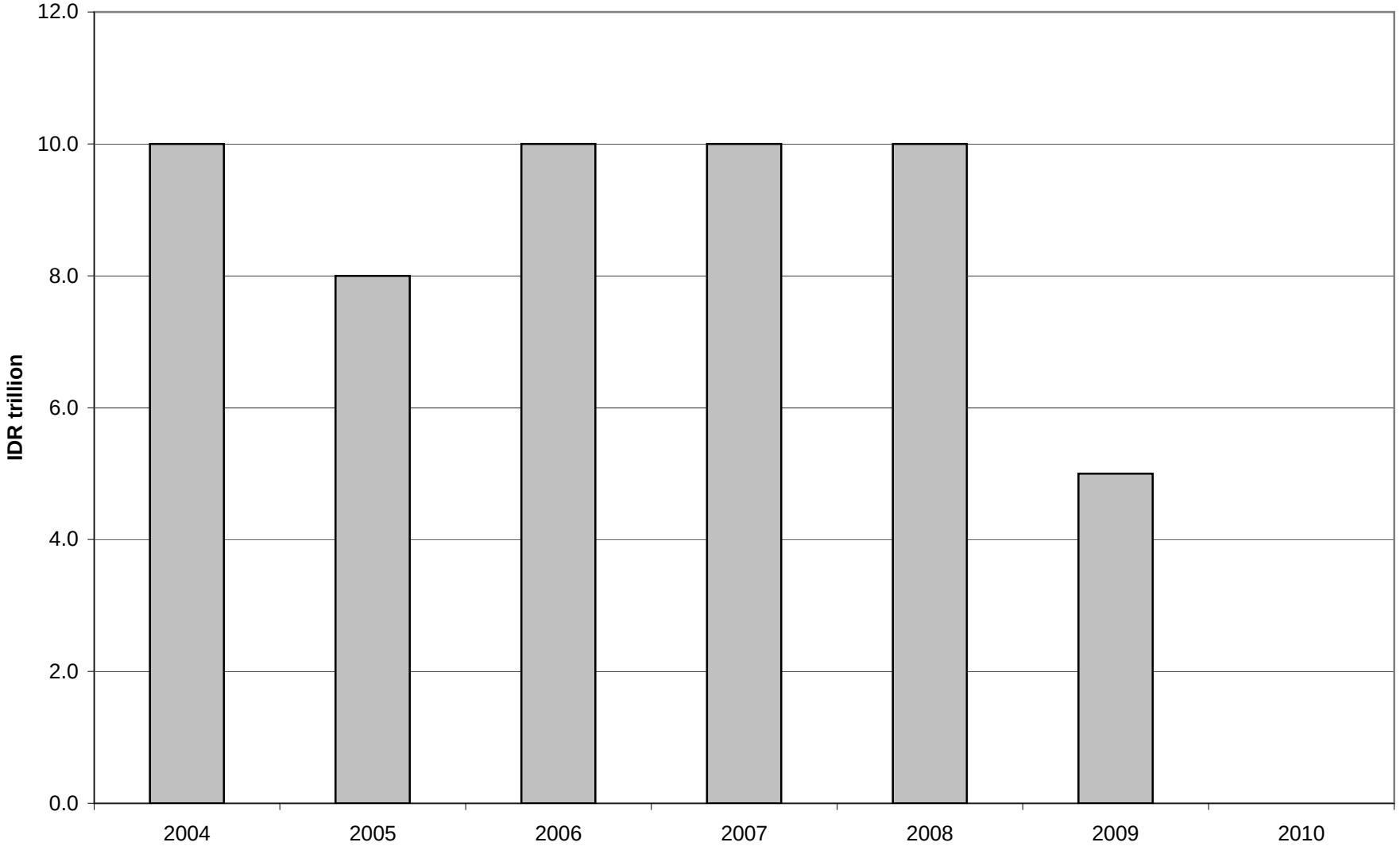

Figure 11: External Financing Components

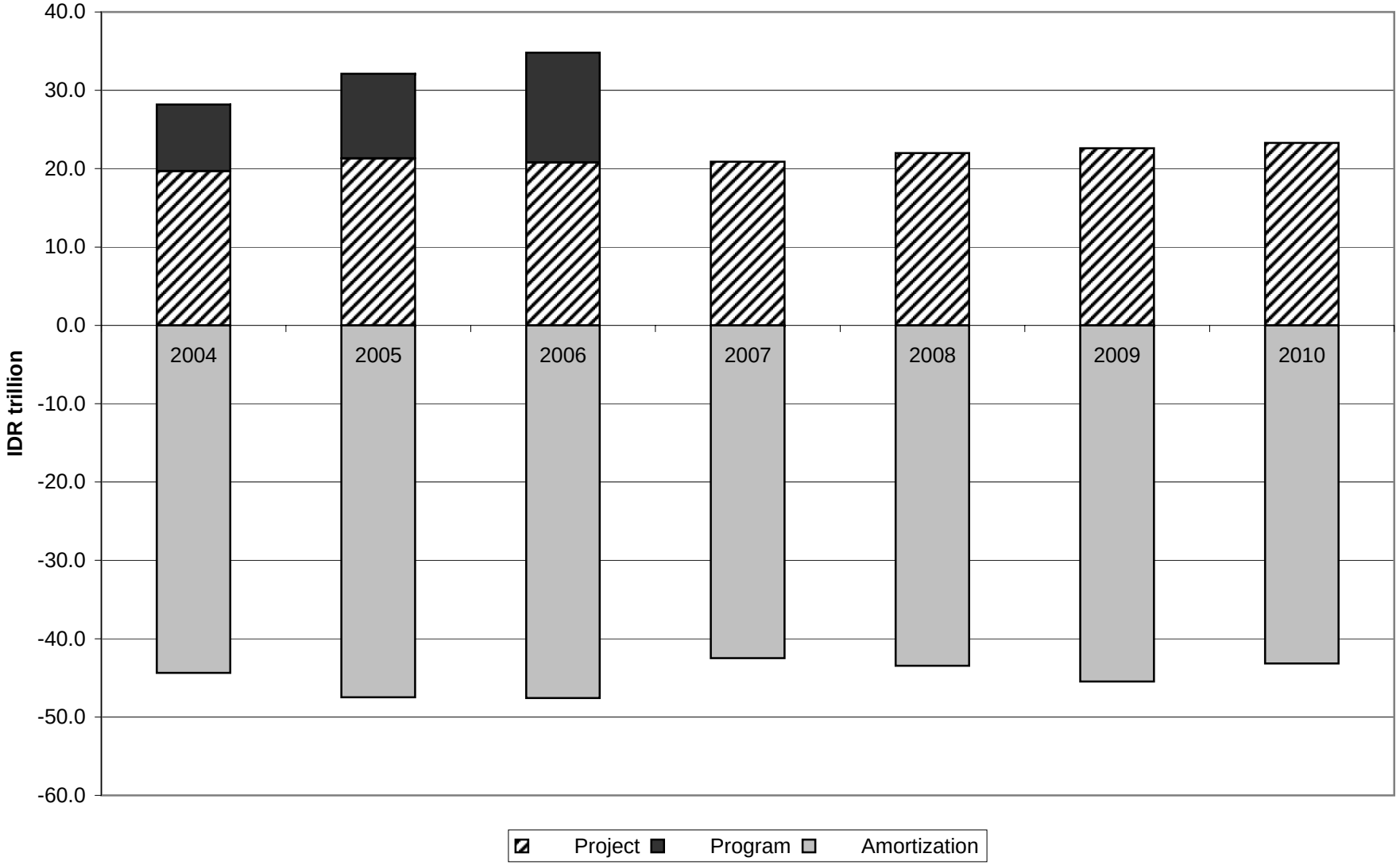

Figure 12: Net External Financing

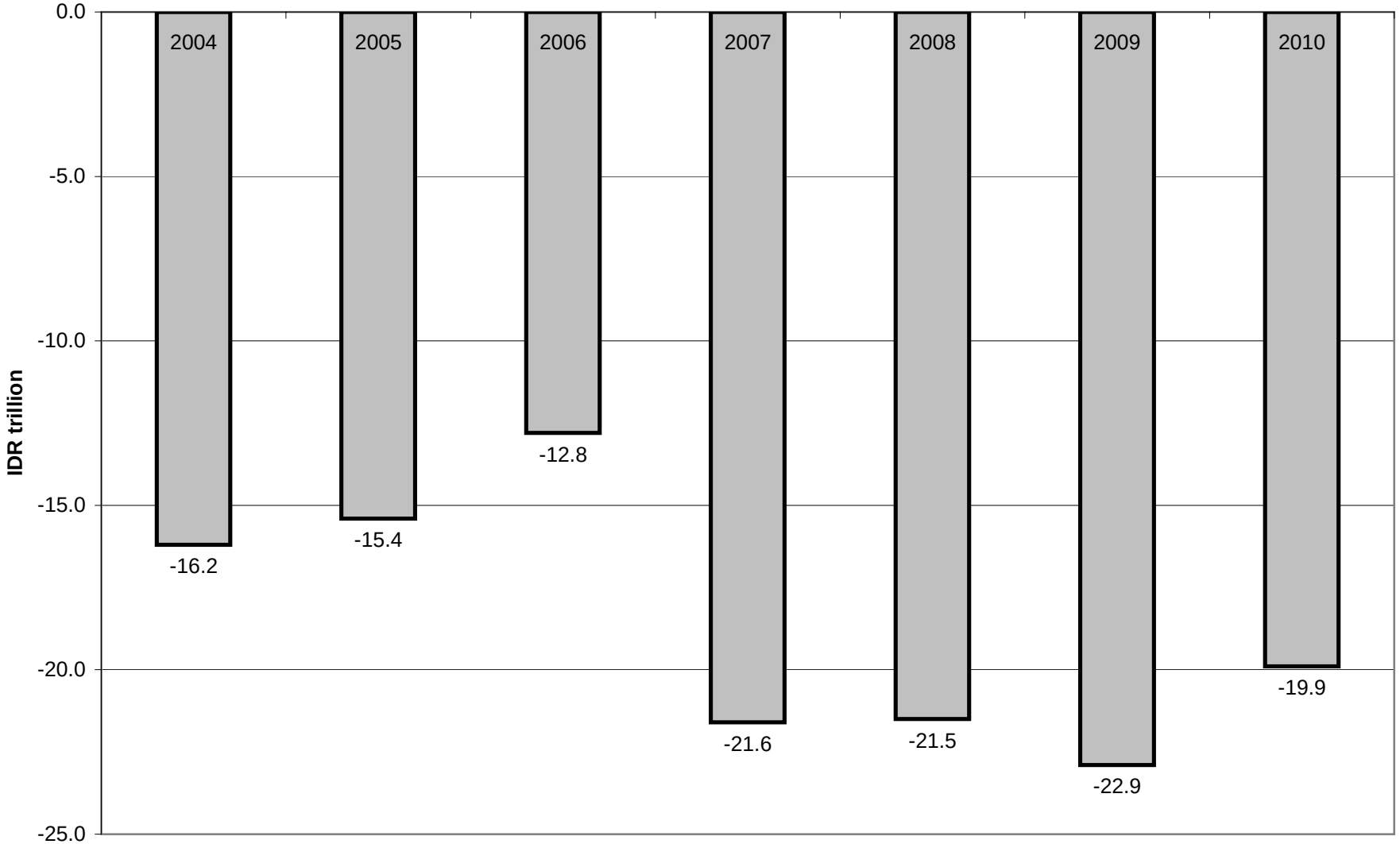

Figure 13: Projected Interest Payments on Government Debt

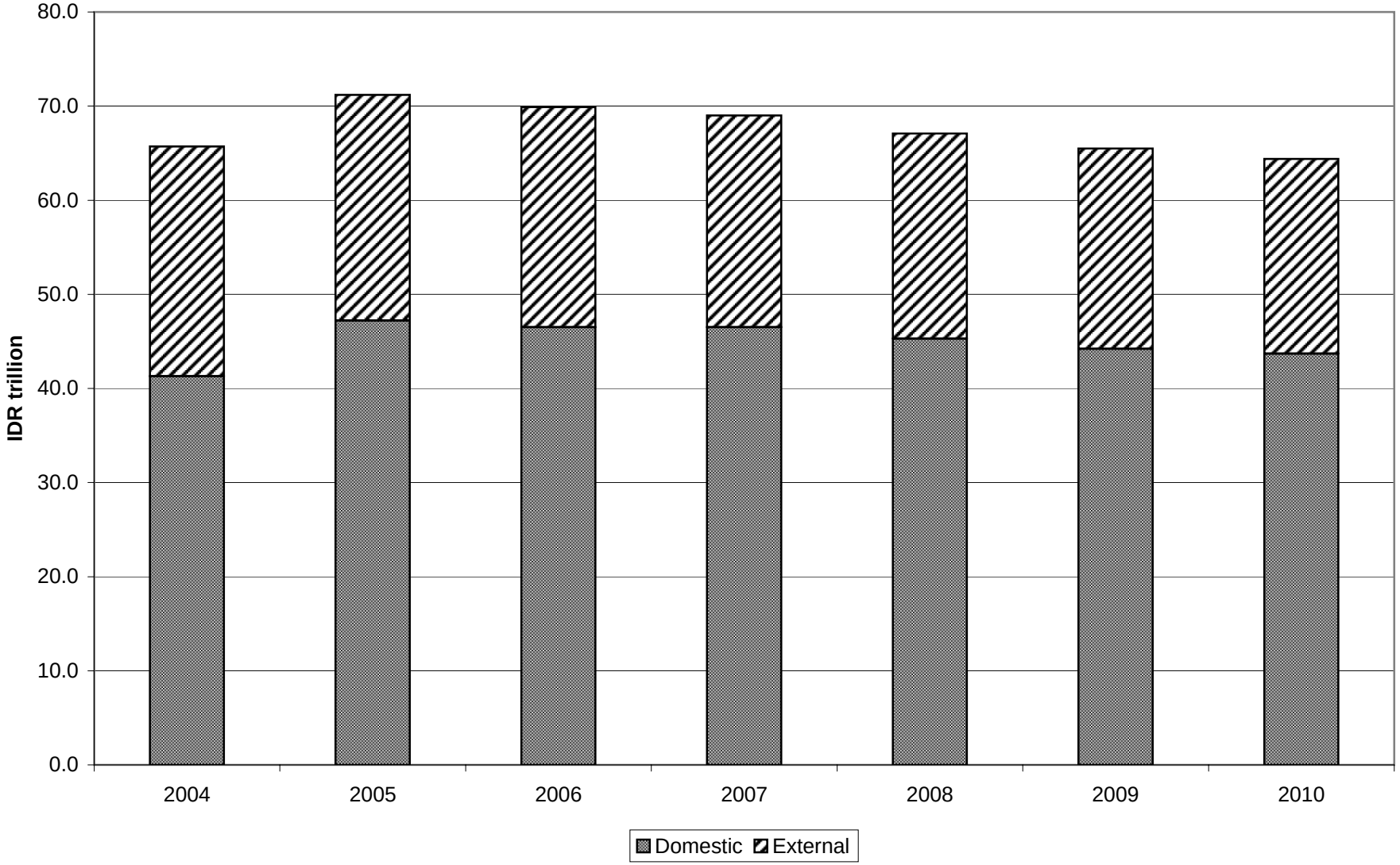

Figure 14: Projected Interest Rates